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RAILWAYS OF SOUTH AMERICA

PART III: CHILE



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RAILWAYS OF SOUTH AMERICA

PART III : CHILE

By

W. RODNEY LONG

Transportation Division



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FOREWORD

This monograph presents detailed information with respect to all the railways of Chile, covering such phases as the development, mileage, operating officials, methods of purchase, finances, traffic statistics, characteristics of right of way, number of employees, motive power, rolling stock, repair shops, and equipment, as well as an analysis of the railway supply market.

The report was prepared by W. Rodney Long, of the Transportation Division of this bureau, through the cooperation of various locomotive and car building companies, manufacturers of railway equipment, exporters of crossties, and other interested companies, with the Transportation Division, the Machinery Division, the Iron and Steel Division, and the Electrical Division of this bureau.

This is the fifth of a series of reports on railways in Latin American countries. Preceding numbers, all issued in the Trade Promotion Series, are:

No. 5. Railways of Central America and West Indies.

No. 16. Railways in Mexico.

No. 32. Railways of South America: Part I, Argentina.

No. 39. Railways of South America: Part II, Bolivia, Colombia, Ecuador, Guianas, Paraguay, Peru, Uruguay, and Venezuela.

The sixth and last volume in this series, covering Brazil, will appear in the near future.

The bureau is grateful for the valuable information furnished by the following officers in the Foreign Service of the State Department: Ambassador William Miller Collier, Santiago; Consul General C. F. Deichman, Valparaiso; Consul Harry Campbell, Iquique; Vice Consul Ronald D. Stevenson, Punta Arenas; Consul Egmont C. von Tresckow, Arica; American Minister Jesse S. Cottrell, La Paz; Consul Stewart E. McMillin, Antofagasta; Vice Consul Ben C. Matthews, Antofagasta; Consul Willard L. Beaulac, Arica; Vice Consul Sidney H. Browne, Antofagasta; Vice Consul C. H. Butler, La Paz; Consul Robert R. Bradford, Iquique; Consul Harold M. Deane, Valparaiso; Consul George D. Hopper, Antofagasta; Vice Consul C. L. McLain, Concepcion; Vice Consul Robert L. Mosier, Concepcion; Chargé d'Affairs ad interim Rudolf E. Schoenfeld, La Paz; Vice Consul Edwin S. Schoenrich, Concepcion; Vice Consul Edward J. Sparks, Valparaiso; Consul S. Reid Thompson, Antofagasta.

Information was also obtained from the Stock Exchange Yearbook (British). The Pan American Union Library, Bureau of Railway Economics Library, and Congressional Library were the chief sources for basic material.

Ralph H. Ackerman, American commercial attaché, Santiago, deserves special credit for his work in straightening out many difficulties that arose as well as in the submission of certain material which was not available in the United States. Thanks are also due to Sr. Carlos de La Barra F., the commercial secretary of the Chilean

Embassy in Washington and to Sr. Genaro Benavides, the representative in the United States of the Chilean State Railways for their assistance.

WILLIAM L. COOPER, *Director,*
Bureau of Foreign and Domestic Commerce.

JANUARY, 1930.

NOTE

In this study, two statistical sources were used, namely, the report of the Ministerio de Fomento, Departamento de Ferrocarriles, titled, "Estadística de los Ferrocarriles en Explotación," and the report issued by the Dirección General de Estadística, titled, "Estadística Anual de la República de Chile, Vol. XII—Comunicaciones." Since this is a railway study, the information prepared by the Ministerio de Fomento, Departamento de Ferrocarriles, has been used whenever possible. In certain instances comparable data over a period of years could not be obtained from the last-mentioned source and in these instances the material used is from the Estadística Anual de la República de Chile.

CONVERSION TABLE OF UNITS USED

Hectare.....	0.0038 square mile; 2.471 acres.
Kilometer (1,000 meters).....	0.621 mile.
Meter.....	3.28 feet.
Metric ton (1,000 kilos).....	2,204.6 pounds.
Kilogram (kilo).....	2.2046 pounds.
Quintal (100 kilograms).....	220.46 pounds.
Hectoliter.....	26.42 gallons.
Metric ton of petroleum.....	6.8 barrels (U. S.).
Cubic meter of petroleum.....	6.3 barrels (U. S.).
Cubic meter of water.....	1 metric ton.
Pound sterling.....	\$4.8665.
Peso.....	6 pence (\$0.1217).
Condor.....	10 pesos (\$1.217).
Half condor.....	5 pesos (\$0.6085).

All monetary conversions, wherever made, are at par. This method is followed throughout by the foreign-owned railways, and differences are entered on the balance sheets as "loss" or "profit" by exchange. Unless otherwise indicated the peso used is of 6 pence (\$0.1217).

Appendix I, page 371, supplies a cross index of the names of all Chilean railways which should be consulted when name of railway does not appear in table of contents.

RAILWAYS OF SOUTH AMERICA

Part III.—CHILE

INTRODUCTION

After Francisco Pizzaro conquered Peru, one of his lieutenants, Diego de Almagro, invaded the country to the south with the intention of taking possession of it in the name of the King of Spain, but his efforts met with little success. In 1540 a second expedition was organized by Pizzaro under the command of Pedro de Valdivia. This expedition proceeded southward to the present site of Santiago where a colony was founded, which has since become the capital of the Republic of Chile.

Little progress in colonization was made until 1640, when the Spanish Governors concluded a treaty with the hostile Indians whereby the Bio-Bio River was recognized as a boundary line between the whites and the Indians. With the conclusion of this treaty the Spanish colonists received the protection of the Indians against invasions of the English and Dutch.

On September 18, 1810, the colonists deposed the Spanish authorities and created a provisional government. This resulted in Spain sending additional troops to prevent the establishment of independence in Chile. On April 5, 1818, the Spaniards were decisively defeated in the battle of Maipu and the Spanish power in Chile was practically ended.

General O'Higgins, the leader of the colonists in this war for independence, was appointed supreme dictator of the Chilean nation. On May 25, 1833, a constitution was formally adopted by the people. This constitution remained in force until October 18, 1925, when a new constitution was adopted.

ORGANIZATION OF THE GOVERNMENT

Chile has a republican form of government, with legislative, executive, and judicial branches. The legislative power is vested in the National Congress, consisting of the Senate and the Chamber of Deputies, both of which are elected by direct popular vote. The Senate is composed of 45 members who represent nine provincial groups. Each of these groups elects five senators. Each senator holds office for eight years, and half of the body is elected every four years. The Chamber of Deputies consists of 132 members, elected by departments or groups of departments, 1 member for every 30,000 inhabitants or fraction of not less than 15,000. All male citizens 21 years of age or over, who are able to read and write, are registered and entitled to vote. All voting is by popular ballot. Congress is in ordinary session from May 21 to September 18. The

President is elected for six years by direct popular vote. A retired President is not eligible for reelection. In legislation the President has a modified veto which may be overruled by the Chamber of Deputies by a two-thirds vote. The validity of all elections of President, Deputies, and Senators is determined by a special body called tribunal calificador, consisting of five members chosen by lot from the following: One each from past presidents or vice presidents of the Chamber and Senate, two from ministers of the supreme court, and one from ministers of the court of appeal of the city where Congress meets.

The President is assisted by a number of ministers of state, one for each department, who constitute a cabinet and are responsible to him. These ministers may speak in Congress but do not vote. The President's cabinet contains the following portfolios: Ministerio del Interior (Interior Department); Ministerio de Relaciones Exteriores y Comercio (State and Commerce Department); Ministerio de Hacienda (Treasury); Ministerio de Instrucción Pública (Instruction); Justicia (Justice); Ministerio de Guerra (War Department); Ministerio de Marina (Navy Department); Ministerio de Fomento; Ministerio de Higiene y Previsión Social; and Ministerio de Propiedad Austral.

The Ministerio del Interior is in charge of the administration of the postal and telegraph offices. It has charge of the appointment of governors and intendentes and also has under its jurisdiction the police and "carabineros."

The Ministerio de Relaciones Exteriores y Comercio is in charge of all of the country's foreign representation, both diplomatic and consular, as well as the commerce division, which is newly organized, and is in charge of the promotion of foreign and domestic trade in Chile.

The Ministerio de Hacienda is in charge of all financial questions and has under its jurisdiction the collection of revenues, taxes, customhouses, banks, nitrate and iodine policy, cajas, inspection of insurance, stock exchanges, as well as the control and preparation of the budget.

The Ministerio de Instrucción Pública has charge of all branches of instruction in primary and secondary schools and universities, as well as the inspection of private schools and academies.

The Justicia has charge of the administration of all legal and judicial matters.

The Ministerio de Guerra is charged with the administration of national safety as well as aviation activities.

The Ministerio de Marina is charged with the administration of national defense by maritime protection.

The Ministerio de Fomento is in charge of all matters pertaining to production, agriculture, mining, railways, forestry, and fishing. It has also the administration of public works, roads, waterways, etc.

The Ministerio de Higiene y Previsión Social handles everything with reference to public health and hospitals and also the administration of social laws and such social and banking institutions as the Cajas de Previsión.

The Ministerio de Propiedad Austral, which was recently created, is only of a transitory character and will handle problems pertaining to colonization of the southern part of Chile.

PHYSICAL CHARACTERISTICS

Chile is located on the west coast of South America between south latitude $17^{\circ} 57'$ and $55^{\circ} 59'$. It is bounded on the east by the Cordillera of the Andes, on the west by the Pacific Ocean, on the north by Peru, and on the south by the Pacific Ocean.

It extends approximately 4,216 kilometers (2,619 miles) from north to south and has an average width of 108 kilometers (67 miles). Its coast line is 4,667 kilometers (2,899 miles) in length. Within its territory lies the Straits of Magellan connecting the Atlantic and Pacific Oceans.

The climate is variable according to the latitude and altitude. It is principally temperate. The subtropical regions are modified by the cold Humboldt current from the Antarctic, while the Cordillera of the Andes shuts off the moist winds from the Atlantic coast. There is practically no snowfall in the northern and central regions, except in the mountains. In the latitude of Santiago there is little snowfall at less than 899 meters (2,949 feet) above sea level and never below 621 meters (2,037 feet). Most of the rains of Chile come in from the Pacific Ocean. North of south latitude 26° rain is almost lacking. One inch of rainfall in 20 years is about the average. In the central meteorological region which begins at Copiapo the rainfall over a period of 24 years was about 0.33 meters (about 1 foot). This district extends to a point about 805 kilometers (500 miles) south of Valdivia. In the southern part of Chile rain is much more abundant, and this region is about as wet as the north is dry.

Chile is a mountainous country with two principal ranges, the Cordillera of the Andes and the Coast Cordillera. They are connected by means of transverse ridges and chains. The highest peak in South America is located in Chile, being Mount Aconcagua, which has an altitude of 7,015 meters (23,015 feet). In the southern end of the country are many volcanoes, both live and extinct.

Streams for the most part have their source in the Cordillera of the Andes and flow through openings in the Coast Cordillera to the Pacific Ocean. They are used mostly for irrigating and hydroelectric purposes. There are 1,368 kilometers (2,714 miles) of navigable rivers and 805 kilometers (500 miles) of lake routes. Some traffic to Argentina is by means of combination steamer and automobile transportation. The southern part of Chile is composed mostly of small islands, the principal one of which is Chiloe. Altogether Chile has an area of 75,051,984 hectares (289,776 square miles), with an estimated population in 1928 of 4,024,000.

For economic purposes, Chile is divided into three so-called economic zones. These are as follows: Northern, south latitude $17^{\circ} 15'$ to 33° ; area, 32,028,976 hectares (0.0038 hectare equals 1 square mile); climate, semitropical and dry; products, chiefly mineral, especially nitrates, copper, and iron. Central, south latitude 33° to 38° ; area, 8,724,674 hectares; climate, chiefly dry and temperate; products, agricultural and mineral. Southern, south latitude 38° to 56° ; area, 34,976,396 hectares; climate, cool and wet; products, forest, cereals, vegetables, and livestock.

LANGUAGE

Spanish is the official language of Chile, although there are minor differences in both spelling and pronunciation between that spoken in Chile and the pure Castilian. All commercial correspondence with Chilean firms should be in Spanish.

CURRENCY AND EXCHANGE

The monetary unit of Chile (law No. 606 of Oct. 14, 1925) is the gold peso of 0.183057 gram of fine gold—the equivalent of 6 pence or \$0.1217 United States currency. Gold, silver, nickel, and paper currency is in circulation. Ten pesos constitute one condor. Since the opening of the Central Bank in January, 1926, exchange fluctuations have been kept within narrow limits.

FINANCIAL CONDITIONS

Since 1925, when important financial legislation was enacted, upon the recommendations of a commission of American financial experts, Chilean financial conditions have shown improvement. The legislation included a new monetary law, a law establishing a central bank, and a general banking law. An organic budget law was also enacted. Monetary and credit conditions have benefited as a result of the enactment of the first three laws, while the organic budget law has helped to bring about an improvement in the country's budgetary operations. Although a large deficit was incurred in the ordinary budget in 1926, the Minister of Finance has reported that ordinary budgetary operations in 1927 and 1928 resulted in surpluses.

BUDGET SYSTEM¹

In the formulation of the Chilean budget each ministry prepares and transmits to the President of the Republic, not later than June 1, an estimate of the expenditures required for the next fiscal year. This estimate sets forth in comparative form the expenditures of the previous fiscal year, the amounts authorized for the current fiscal year, and the amounts estimated for the succeeding fiscal year. The President may by decree delegate to the Ministry of Finance, or to a fiscal department which the President may create for the purpose, the power and duty of centralizing the estimates of expenditures prepared by each ministry and preparing the draft of the annual budget bill, introducing therein, with the approval of the President, such changes in the estimates of expenditures, as submitted by the ministries, as the estimated receipts and the financial condition of the country may seem to require to assure a balanced budget.

The Minister of Finance submits to the President, for transmittal with the annual budget, a report upon the financial situation of the country, the condition of its credit, and a general outline of the fiscal policy of the Government.

The budget as finally approved by the Executive is divided into three parts. The first part contains a summary of the budget of revenues and expenditures; the second, the details of the revenues;

¹ Taken from *Latin American Budgets*, Part II, Chile, Peru, Bolivia, and Ecuador. Trade Information Bulletin No. 517, Bureau of Foreign and Domestic Commerce, 1927. While a new budget system was put in operation in June, 1929, the Chilean Embassy indicates that there were no major changes from the system outlined here.

and the third, the details of the expenditures. It is provided that expenditures shall be based upon revenues and shall not be in excess of such revenues. The expenditures are to be considered as the estimate of the amounts required to carry on Government services included therein.

BUDGET OF REVENUES

The budget of revenues is divided into two parts. The first part contains the annual provisions respecting public receipts which the Government may consider necessary to include therein; these provisions may not create new taxes nor modify or suppress existing taxes. The second part contains the items of receipts classified according to the most important sources from which they are derived, the classification being as follows: (a) National properties (*bienes nacionales*), (b) national services (*servicios nacionales*), (c) taxes (*impuestos directos e indirectos*), (d) miscellaneous receipts (*entradas varias*).

The budget of revenues must cite the laws in force authorizing the collection of revenues and other receipts. The estimated proceeds from foreign or domestic loans and similar credit transactions may not appear in the budget of revenues.

The estimate of revenues, with the exception of the income from the taxes on nitrate and its by-products, may not exceed the average of the actual receipts of the preceding three years. It is provided, however, that where additional revenues may be expected to result from legislation already enacted, such additional revenues may be included as a separate item. The estimate of revenues to be realized from the nitrate industry may not be greater than the lowest amounts actually received therefrom during the preceding five years. All revenues are covered into a general fund to meet the expenditures of the Government. No item may be included in the budget of revenues unless it represents and is supported by an estimate of the revenues expected to be obtained from that source.

BUDGET OF EXPENDITURES

The budget of expenditures, like that of revenues, is divided into two parts, the first part containing the annual provisions or regulations relative to the public expenditures which, in the opinion of the President, should be included in the annual budget law, and the second part comprising the expenditures required to carry on the Government services for the fiscal year. Expenditures must be set forth in detail and the credits opened or authorized must be applied exclusively to the objects for which they have been appropriated. No item may be included in the budget of expenditures unless it represents and is supported by an estimate of the amount required for the purpose or object stated therein. For the payment of contingent expenditures a definite sum must be stated, based on the probable amount required for the purpose.

CONGRESSIONAL ACTION ON BUDGET

The budget must be approved by Congress before the opening of the fiscal year during which it is to operate. If it has not been approved before that time it automatically becomes the budget law for the fiscal year, as provided in the constitution. Congress may

not increase any of the variable items of the budget of expenditures as proposed by the President, nor insert any new items unless the President approves such change; furthermore, no additional expenditures may be voted if thereby the total expenditures estimated are in excess of total revenues estimated. Congress may, however, reduce or eliminate any item of expenditure which has been proposed by the President.

PRESIDENTIAL VETO

The President may veto one or more items of the budget bill as passed by Congress but this veto does not affect the rest of the bill, which, upon approval of the President, becomes law.

TRANSFER OF CREDITS WITHIN BUDGET

Transfers of credits from one budget item to another is permissible only within narrow limits; in any case requests for such transfers must be submitted through the comptroller general, who must certify to the condition of the respective items concerned and may express his opinion in writing as to the advisability of the proposed transfers.

SUPPLEMENTARY CREDITS

The power to authorize or propose additional credits in excess of existing appropriations, or to make an expenditure not specifically authorized in the budget law, is vested only in the President. These additional credits are of two kinds, supplementary credits and extraordinary credits; congressional approval is necessary in either case.

Supplementary credits are those authorized or proposed to increase existing appropriations. They may not be opened until eight months after the beginning of the fiscal year for which the appropriations have been authorized.

Extraordinary credits are those authorized or proposed in case of internal disorders, public calamity, or other emergencies involving a new and urgent need, for which no appropriation of funds was made in the budget law.

The President must submit to Congress with each request for additional credits a statement indicating the source of the funds to meet such additional outlays. In no case may supplementary credits result in a budget deficit, nor may any extraordinary credit or any law involving the expenditure of public funds be passed unless Congress at the same time provides the revenues to meet such expenditures.

No bill may be passed by Congress which would operate to repeal any law, the revenues from which are included in the budget law of the current or of the following fiscal year, unless at the same time Congress provides new revenue in place of the old, or unless it is provided in the repeal bill that the provisions thereof do not become effective until after the close of the fiscal year covered by the last budget law.

LIQUIDATION OF THE BUDGET

The fiscal year corresponds to the calendar year. For the purpose of liquidating the accounts, however, there is a supplementary period, extending through the first four months of the following year, during which will be continued the collection of revenues pertaining to the previous fiscal year and the payment of liabilities incurred in that year. No expenditure from one fiscal year may be charged to

the appropriations of any other fiscal year. If obligations pending at the end of a fiscal year have not been paid within the supplementary period of four months, new appropriations therefor must be made in the next budget.

CHILEAN BUDGET FOR 1929:

The ordinary budget for Chile for 1929 as approved by Congress calculates receipts at 1,123,291,500 pesos and expenditures at 1,071,603,975, thus anticipating a surplus of 51,687,525 pesos. It should be noted, however, that the figure for receipts includes an item of 20,000,000 pesos, representing the estimated surplus resulting from financial operations in 1928. It is estimated that the income derived from the various sources of revenue will be as follows:

	Pesos
National properties.....	41, 094, 000
National services.....	76, 595, 500
Direct and indirect taxation:	
Imports.....	257, 500, 000
Exports.....	250, 000, 000
Income.....	139, 000, 000
Other.....	270, 642, 000
Various receipts.....	68, 460, 000
<hr/>	<hr/>
Total.....	1, 103, 291, 500
Surplus 1928.....	20, 000, 000
<hr/>	<hr/>
Grand total.....	1, 123, 291, 500

ORDINARY EXPENDITURES

Expenditures authorized in the ordinary budget for 1929 are 128,915,000 pesos greater than the total authorized in the 1928 ordinary budget. Itemized expenditures to be made during 1929 are as follows:

	Pesos
Presidency of the Republic.....	892, 180
Congress.....	7, 361, 752
Independent services.....	3, 800, 000
Interior.....	133, 851, 343
Foreign relations.....	17, 607, 480
Treasury.....	412, 627, 454
Public education.....	145, 029, 554
Justice.....	26, 236, 362
War.....	112, 724, 585
Navy.....	114, 915, 815
Industry.....	55, 895, 220
Social welfare.....	40, 662, 230

Total ordinary expenditures..... 1, 071, 603, 975

Of the total ordinary expenditures itemized, 620,429,271 pesos are to be expended for administrative purposes and 235,650,844 for the service of the public debt. Other important expenditures are 119,114,200 pesos for social protection and 73,195,000 appropriated as fiscal quotas to special funds and services.

² Taken from Commerce Reports of Feb. 11, 1929.

EXTRAORDINARY EXPENDITURES

The extraordinary budget as approved authorizes expenditures totaling a little over 225,000,000 pesos. This amount is to be expended as follows:

	Pesos
Interior.....	12, 149, 797
Treasury.....	6, 565, 500
Education.....	22, 565, 900
Justice.....	5, 300, 000
Navy.....	65, 059, 405
Industry.....	62, 450, 000
Social welfare.....	29, 838, 789
Losses and expenses from loan issues.....	21, 169, 609
Total extraordinary expenditures.....	225, 099, 000

Extraordinary expenditures are to be made from the proceeds of external or internal loans which the President is authorized to contract. The interest rates are not to exceed 7 per cent for internal loans nor 6 per cent for external loans.

RAILWAY APPROPRIATIONS

In order that there will be no confusion as to the exact position of the Chilean State Railways, it might be stated that this organization, is an autonomous body and required to maintain itself out of earned income. Appropriations for its existence are not carried in any of the budgets, although the State is responsible for losses incurred. During the years when the State Railways show an operating deficit, the loss is generally made up through the proceeds of an internal loan and is liquidated out of the following year's earned operating income. If during successive years losses occur, and the accumulation is too great to be paid out of operating income, a loan is negotiated to liquidate this deficit. The Chilean State Railways are also required to spend earned income for new railway construction projects in connection with their own railway lines. At least this has heretofore been the practice. In 1929, the legislative body authorized a railway construction program amounting to approximately 106,500,000 pesos. This program will be financed out of the proceeds of a loan which is to be negotiated by the Chilean Government and is not to be charged to the operating accounts of the Chilean State Railways.

PUBLIC DEBT

As will be noted in the table, the major portion of the Chilean public debt consists of direct external obligations. The guaranteed or indirect debt includes obligations of the National Mortgage Bank, the State Railways, and various municipalities. The bulk of the guaranteed debt is also external. Chile borrowed abroad as early as 1822 and has made a good record in meeting its foreign obligations. A detailed discussion of the Chilean public debt will be found in Special Agents Series No. 224, "Chilean Public Finance," and Trade Information Bulletin No. 517, "Latin American Budgets, Part II, Chile, Peru, Bolivia, and Ecuador," issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce. While Chile's earlier foreign loans were nearly all obtained from British bankers,

since 1921 the greater part of its external loans have been floated in the United States.

The floating debt, including accumulated deficit and paper money, incorporated up until 1926 a note circulation carried at 450,000,000 pesos, the responsibility for which was assumed by the Banco Central de Chile in that year. It will be noticed from the table that the debt per capita declined from 711 pesos in 1922 to 646 pesos in 1924 and then gradually increased until it again reached 711 pesos in 1927. According to the 1928 budget, the service of the public debt amounted to approximately 25 per cent of the estimated ordinary income of the treasury as compared with 37 per cent for the fiscal year ended June 30, 1929, in England, and 18 per cent for the calendar year 1928 in the United States.

The following table shows the movement of the public debt during the six years 1922 to 1927, inclusive:

CHILEAN PUBLIC DEBT

[In thousands of pesos ¹]

Debt	1922	1923	1924	1925	1926	1927
External.....	1, 419, 217	1, 320, 580	1, 298, 282	1, 249, 056	1, 819, 542	1, 758, 158
Guaranties.....	483, 688	496, 844	478, 909	450, 015	662, 320	899, 346
Internal.....	264, 957	245, 254	261, 952	276, 447	149, 681	109, 113
Floating (including accumulated deficit and paper money).....	557, 756	615, 653	484, 841	586, 248	² 160, 530	³ 124, 473
Total.....	2, 725, 614	2, 678, 331	2, 523, 984	2, 561, 766	2, 792, 073	2, 891, 090
Debt per capita.....	<i>Pesos</i> 711	<i>Pesos</i> 692	<i>Pesos</i> 646	<i>Pesos</i> 649	<i>Pesos</i> 701	<i>Pesos</i> 711

¹ Conversions made at par. Pound sterling converted at 40 pesos. Dollar exchange at \$0.1217.

² Commencing in January, 1926, Banco Central de Chile assumed responsibility for Government note issues amounting to 405,629,119 pesos, and took over gold from the conversion fund amounting to 409,716,702 pesos. The difference of 4,087,583 was applied by the Government to the capital of the Banco Central.

³ Represents accumulated deficit only.

RAILWAY CAPITALIZATION

The following table summarizes the capital invested in Chilean railways, both State and privately owned, according to data furnished by the Anuario Estadística de la República de Chile. It is interesting to note that at the end of the calendar year 1927 approximately 1,800,000,000 pesos were invested in Chilean railways. Of this amount only 9 per cent, or approximately 173,000,000 pesos, represented Chilean capital invested in privately owned railways, while 46 per cent, or 856,000,000 pesos, constituted Chilean capital invested in the Government-owned railways. The largest amount of foreign capital invested in these enterprises was British, amounting to 782,000,000 pesos, or 42 per cent. North American interests approximated slightly less than 3 per cent of the total capital invested, or approximately 50,000,000 pesos.

CAPITAL OF CHILEAN RAILWAYS CLASSIFIED BY NATIONALITY DURING THE YEARS 1912-1927 ¹

Year	State railways	Private railways					Grand total
		Chilean	English	German	North American ²	Total	
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1912. . . .	723, 894, 930	47, 365, 611	689, 816, 904	9, 734, 832	-----	746, 917, 347	1, 470, 812, 277
1913. . . .	1, 022, 018, 504	62, 444, 109	674, 978, 712	4, 166, 664	-----	741, 589, 485	1, 508, 103, 363
1914. . . .	701, 136, 174	85, 112, 859	675, 391, 629	-----	-----	790, 504, 488	1, 491, 640, 662
1915. . . .	1, 045, 188, 813	112, 029, 525	618, 778, 680	-----	-----	730, 808, 205	1, 775, 997, 018
1916. . . .	1, 071, 580, 866	116, 843, 826	685, 604, 046	-----	11, 246, 676	813, 694, 548	1, 885, 275, 414
1917. . . .	1, 154, 221, 959	81, 933, 355	542, 984, 172	-----	14, 087, 826	636, 325, 353	1, 790, 547, 312
1918. . . .	1, 208, 453, 160	72, 467, 454	537, 632, 946	-----	14, 528, 790	624, 629, 190	1, 833, 082, 350
1919. . . .	1, 182, 692, 670	71, 580, 780	627, 380, 583	-----	14, 729, 094	713, 690, 457	1, 896, 383, 127
1920. . . .	1, 322, 608, 062	94, 503, 753	476, 048, 352	-----	14, 729, 094	585, 281, 199	1, 907, 889, 261
1921. . . .	1, 333, 389, 267	101, 796, 738	458, 621, 610	-----	14, 729, 094	575, 147, 442	1, 908, 536, 709
1922. . . .	939, 658, 392	103, 458, 155	457, 479, 564	-----	14, 729, 094	575, 666, 813	1, 515, 325, 205
1923. . . .	832, 766, 283	127, 024, 848	589, 755, 774	-----	38, 088, 252	754, 868, 874	1, 587, 635, 157
1924. . . .	473, 462, 691	133, 111, 919	573, 333, 198	-----	38, 088, 252	744, 533, 369	1, 217, 996, 060
1925. . . .	428, 148, 817	124, 993, 722	583, 666, 302	-----	53, 948, 966	762, 608, 990	1, 190, 757, 807
1926. . . .	897, 247, 428	113, 285, 416	628, 215, 794	-----	59, 703, 702	791, 204, 912	1, 683, 723, 246
1927 ³ . . .	856, 376, 086	173, 632, 210	782, 783, 984	-----	50, 415, 021	1, 006, 831, 215	1, 863, 207, 301

¹ According to Anuario Estadístico de la República de Chile. These data do not coincide with figures shown in Estadística de los Ferrocarriles en Explotación but are used because they were available over a period of years.

² Does not include Chuquicamata Railway.

³ Does not include 315,716 pesos of Italian capital invested in Ferrocarril Yungay, Barrancas, and Pudahuel.

COMMERCE AND INDUSTRIES

The commerce and industries of Chile, generally speaking, are divided into three parts—agriculture, stock raising, and forestry; mining; and manufacturing.

AGRICULTURE, LIVESTOCK, AND FORESTRY

Owing to its varied climate which divides the country into the previously mentioned economic zones, its agricultural resources are varied and sufficient to sustain a population of from 15,000,000 to 18,000,000 persons. The chief agricultural products are wheat, oats, barley, and other cereals; alfalfa, hay, clover, and forage grasses; vegetables; fruits; and dairy products.

The forest products include many varieties of hardwoods, pulpwoods, and woods suitable for the construction of houses and furniture; charcoal making; railway ties; and shipbuilding; and in addition, balsam and aromatic trees.

Its livestock industry is varied and includes sheep and cattle raising, ostrich ranching, poultry farming, and horses, mules, and asses.

The estimated value of Chilean agricultural, animal and dairy, and forest (exclusive of lumber) production during the years 1922 to 1927 are shown in the following table:

ESTIMATED VALUE OF CHILEAN AGRICULTURAL, ANIMAL AND DAIRY, AND FOREST
(EXCLUSIVE OF LUMBER) PRODUCTION ¹

[In thousands of pesos]

	1922	1923	1924	1925	1926	1927
Agriculture.....	769,000	827,000	795,000	768,000	717,000	722,000
Animal and dairy.....	370,000	387,000	378,000	370,000	362,000	365,000
Forest (excluding lumber).....	34,000	51,000	43,000	34,000	26,000	28,000
Total.....	1,173,000.	1,265,000	1,216,000	1,172,000	1,105,000	1,115,000
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
Per capita.....	306	326	311	296	277	278

¹ This estimated table is based on data solicited from the Chilean Government Statistical Bureau, by the Chile-American Association for the calendar year 1926. The production trend from the period 1922 to 1925 and 1927 was gaged through the cooperation afforded by the foodstuffs and lumber divisions of this bureau as indicated by material available in their files and data prepared by the International Institute at Rome.

MINERAL PRODUCTION

Chilean mineral production during 1928 reached the highest level of the 7-year period indicated in the following table. This increase in production, which amounted to approximately 700,000,000 pesos, was owing to the stimulus received from the nitrate industry which produced nitrate valued at approximately 500,000,000 pesos more than in 1927. Copper production increased approximately 180,000,000 pesos, while iodine reached approximately the same level as in 1925, or an increase of about 20,000,000 pesos over 1927.

In minerals Chile is one of the richest countries in the world, but has not yet been developed to its fullest extent because of lack of transportation facilities. It is now impossible to mine some of the low-grade ore in the interior regions owing to the excessive cost of bringing it to the coast. With the development of improved means of transportation, these regions will become active producers of minerals.

The following table indicates the mineral production of Chile for the calendar years ended December 31, 1922, to 1928, inclusive. It will be noticed that during this entire period there was a steady upward trend, with the exception of the years 1926 and 1927 when there was a considerable decrease due to the falling off in the nitrate production.

MINERAL PRODUCTION

[Thousands of pesos]

Mineral	1922	1923	1924	1925	1926	1927	1928
Gold.....	8,582	10,941	11,548	10,401	11,307	3,491	3,321
Silver.....	15,049	18,202	17,169	18,360	14,620	5,760	5,923
Copper.....	276,446	411,486	415,429	414,688	436,323	497,558	676,764
Lead.....	127	987	1,284	3,716	2,395	1,472	765
Iron.....	15,473	35,936	54,979	26,774	11,870	13,213	13,344
Sulphur.....	2,257	3,378	2,490	3,538	3,482	5,313	7,052
Chalk.....	4,000	3,123	2,061	6,544	6,527	10,239	356
Guano.....	2,967	3,278	4,768	3,540	4,111	8,038	1,178
Nitrate.....	439,973	788,801	980,943	1,033,628	792,557	543,461	1,043,632
Iodine.....	15,862	39,570	49,557	83,891	63,426	54,925	83,560
Borates.....	22,628	20,804	23,347	23,797	20,800	12,277	11,360
Salt.....	3,009	3,213	3,084	2,412	2,761	5,724	3,127
Coal.....	78,975	90,794	120,053	81,138	88,821	82,874	75,388
All other.....	1,313	1,612	1,248	2,398	2,867	4,059	14,984
Total.....	886,661	1,432,125	1,687,960	1,714,825	1,461,867	1,248,404	1,940,754

Source: Official Chilean Government statistics.

MANUFACTURING INDUSTRIES

Because of the natural resources possessed by Chile, there is opportunity for intensive industrial development. The abundance of raw materials and unlimited water power are economic requisites which are necessary to an industrial empire. Chile at this time might be classified as being in the first cycle of an industrial growth, which originated during the World War with the establishment of textile and other mills. The Government is supporting this development by imposing protective duties, creating schools for technical training, and through the support of a semiofficial organization known as the Society for Industrial Promotion. In addition a law was enacted in 1927, which established a credit institution authorized to extend long-term loans to manufacturers against machinery, stocks, raw materials, and other mortgageable properties at moderate rates of interest. The following table is a summary of the manufacturing industries of Chile:

MANUFACTURING INDUSTRIES

Year	Capital invested	Number of establishments	Number of employees	Cost of materials	Value of products	Production value of manufactures
	<i>Thousands of pesos</i>			<i>Thousands of pesos</i>	<i>Thousands of pesos</i>	<i>Thousands of pesos</i>
1913.....	1,964,512	7,841	85,008	291,429	654,837	363,408
1922.....	2,991,414	3,042	76,042	582,339	1,064,090	481,751
1923.....	3,820,179	3,196	82,118	614,193	1,172,602	558,409
1924.....	4,982,766	3,254	85,067	741,831	1,328,185	586,354
1925.....	5,348,874	3,221	83,779	813,771	1,471,584	657,813
1926.....		3,075	78,449			¹ 602,000
1927.....						² 650,000

¹ Figure furnished by Chile-American Association (estimated).

² Estimated.

Source: Official Chilean Government statistics.

FOREIGN TRADE

An increase of approximately 300,000,000 pesos of merchandise exports, including both national and nationalized goods, from 1,662,-712,000 pesos during the calendar year ended December 31, 1927, to 1,962,933,000 pesos during 1928 is shown by the Chilean Government reports. Merchandise imports likewise increased approximately 123,000,000 pesos, or from 1,072,991,000 pesos in 1927 to 1,196,192,000 pesos in 1928.

Bullion and specie imports during 1928 exceeded exports by 187 per cent, or an excess of 2,506,000 pesos of imports over exports. Imports of bullion and specie during 1927 were less than 1,000 pesos as compared with exports of 26,955,000 pesos.

The following table shows that during the calendar years from 1922 to 1928 the total merchandise exports per capita increased about 89 per cent, or from 258 pesos in 1922 to 487 pesos in 1928, and imports per capita increased approximately 60 per cent, or from 185 pesos in 1922 to 297 pesos in 1928. It is somewhat unfair to show a comparison of the year 1922 with 1927, as the year 1923 reflected for the first time the commencement of a recovery from the postwar depression which was climaxed in so many Latin American countries in 1920 or 1921 instead of 1922. This recovery in 1923 coupled with increased

nitrate exports increased total exports per capita 61 per cent over 1922. This is the largest yearly percentage increase reached during this period. This increase in exports naturally served to enlarge the purchasing power per capita with the corresponding result of increased imports which amounted in 1923 to 38 per cent per capita more than in 1922. This likewise was the largest yearly per cent per capita reached during this period. The following table indicates the exports, imports, and balance of trade:

EXPORTS, IMPORTS, AND BALANCE OF TRADE OF CHILE¹

Year	Total domestic exports of merchandise	Total exports per capita	Total imports of merchandise	Total imports per capita	Total excess of domestic exports (+) over imports	Domestic exports of bullion and specie	Imports of bullion and specie	Excess of bullion and specie exports (+) over imports	Total excess of exports (+) over imports
	<i>Thous. of pesos</i>	<i>Pesos</i>	<i>Thous. of pesos</i>	<i>Pesos</i>	<i>Thous. of pesos</i>	<i>Thous. of pesos</i>	<i>Thous. of pesos</i>	<i>Thous. of pesos</i>	<i>Thous. of pesos</i>
1922-----	991,402	258	711,545	185	+279,857	3,427	-----	+3,427	+283,284
1923-----	1,608,887	415	987,923	255	+620,964	2,744	9	+2,735	+623,699
1924-----	1,801,624	461	1,089,770	278	+711,854	2,763	2	+2,761	+714,615
1925-----	1,865,691	472	1,208,251	306	+657,440	3,164	15,127	-11,963	+645,477
1926-----	1,449,795	363	1,288,954	323	+160,841	191,900	3,720	+188,180	+349,021
1927-----	1,632,712	414	1,072,991	267	+559,721	25,955	-----	+26,955	+616,676
1928-----	1,962,933	487	1,196,192	297	+766,741	1,336	3,842	-2,506	+764,235

¹ Exports for 1927 and 1928 include both national and nationalized goods. Brussels classification used for bullion and specie for years 1924-1928, inclusive.

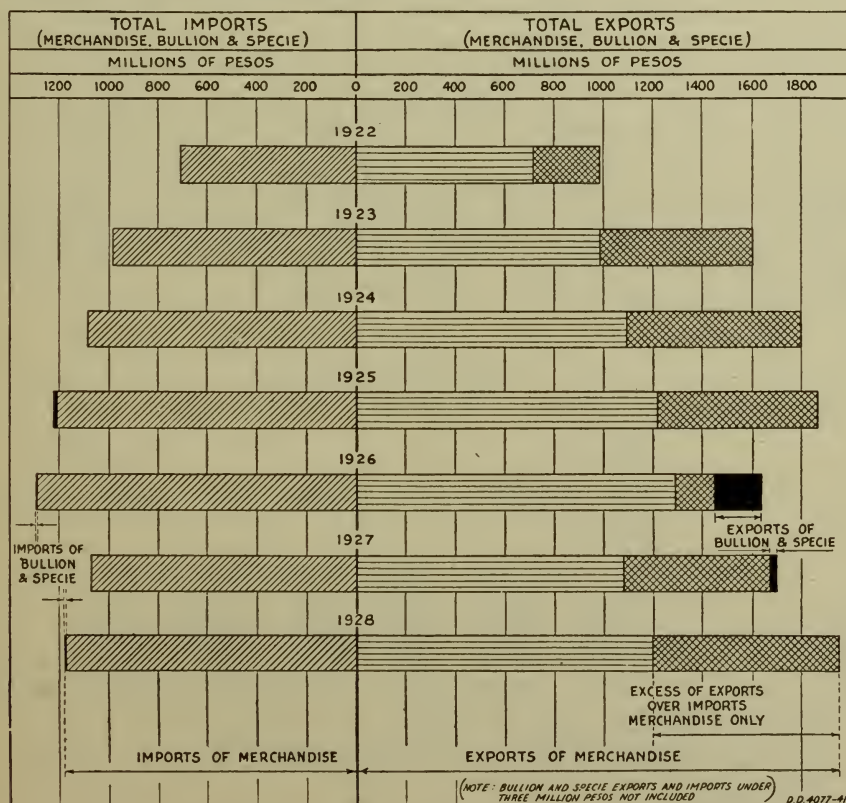


FIGURE 1.—Exports, imports, and balance of trade of Chile

Chile has maintained a favorable trade balance based on total merchandise, bullion, and specie imports and exports during the 7-year period 1922 to 1928, inclusive. In only two of these years, namely, 1925 and 1928, has Chile imported more bullion and specie than it exported while at no time during the period has its merchandise imports exceeded its exports. Consideration, however, must be given to the invisible items of foreign trade which in the case of Chile would be interest payments on the foreign debt and dividend remittances by foreign companies. Just what per cent, if any, of this is included in the above table can not be definitely determined.

The combined excess of exports over imports during 1928 shows a 24 per cent increase over 1927, or a trade balance of 764,235,000 pesos in 1928 as compared with 616,676,000 pesos in 1927.

EXPORTABLE GOODS PRODUCED AND PROPORTION EXPORTED

Merchandise imports in 1927 approximated 39.2 per cent of the total foreign trade of the country while domestic merchandise exports amounted to 60.8 per cent. These domestic exports likewise represented approximately 50 per cent of the total tangible estimated production of exportable goods. Certain economic factors such as construction activities, could not be classified in the production tabulation and their value is consequently not included.

Since 1922 there has been a steady upward trend in the relationship of domestic exports to the production of exportable goods. According to the data available this was broken only in 1926. No doubt this upward movement is owing in part to the stimulation of commercial activities through new railway construction facilitating transportation with production centers. This also would account in part for the upward trend in imports. The development of new markets for domestic commodities would automatically not only increase the purchasing power of the country but likewise its standard of living, which would bring into Chile commodities not previously imported.

The following table indicates the tangible estimated production of exportable goods produced in Chile as compared with the domestic exports for the period 1922 to 1927, inclusive:

PRODUCTION OF EXPORTABLE GOODS AND PROPORTION EXPORTED

[Thousands of pesos]

Year	Agricultural, animal and dairy, and forest products (exclusive of lumber) ¹	Manufactures ²	Mining	Freight receipts	Total	Total domestic exports ³	Per cent of total
1922-----	1,173,000	481,751	886,661	196,296	2,737,708	991,402	36.2
1923-----	1,265,000	558,409	1,432,125	261,456	3,516,990	1,608,887	45.7
1924-----	1,216,000	586,354	1,687,960	281,236	3,771,560	1,801,624	47.7
1925-----	1,172,000	657,813	1,747,039	299,526	3,876,378	1,865,691	48.1
1926-----	1,105,000	⁴ 602,000	1,494,016	288,283	3,489,299	1,449,795	41.5
1927-----	1,115,000	⁵ 650,000	⁴ 1,280,715	286,014	3,331,729	1,662,712	49.9

¹ See data under preceding paragraph with this heading.

² Value added to materials by manufacture is used to represent manufactures.

³ Does not include bullion and specie.

⁴ Figures furnished by Chile-American Association (estimated).

⁵ Figure estimated.

CUSTOMS REGULATIONS AND TARIFFS³

Visaed invoices and bills of lading are required on all freight shipments to Chile valued at more than \$100, in addition to the usual export documents. The documents should be presented at the Chilean consulate in the port of shipment for certification at least 48 hours before the vessel is scheduled to sail, otherwise an overtime charge is made. Two copies of the invoice should be sent to the consignee by the steamer that carries the goods; the visaed copy of the bill of lading, and preferably an extra copy, should likewise go by the same boat to the banker, agent, or consignee, as the case may be.

A bill of lading must be presented at the Chilean consulate for visa. The consul returns it with his visa to the shipper. It is advisable for the shipper to send an additional copy of the bill of lading to the consignee besides the one bearing the consulate visa. Bills of lading must show net weights. "To-order" shipments are duly recognized, provided the name of the consignee is added in parentheses.

The consular invoices must conform to the standard document which may be obtained at any Chilean consulate. Five copies, in Spanish, must be presented to a Chilean consul for visa; two are returned to the shipper. In the consular invoice the following data must be set forth:

Name and address of shipper and consignee.

Port of shipment, of unloading, and place of final destination of the cargo.

Name of the vessel and means of transportation.

Mark, serial number, quantity, and kind of packages, and the gross, net, and legal weight of each.

Description of goods and their component materials.

Gross weight and net weight of goods (net weight is sufficient where different kinds of goods are imported in the same container).

Value per unit and total amount in American dollars.

Statement of country of origin in a sworn declaration signed by shipper or manufacturer must appear in invoice.

The invoice forms must be filled out with minute attention to detail and should be closely scrutinized for errors, in order that the importer may have accurate and proper information to effect clearance of the shipment at the Chilean customhouse. Otherwise, the clearance of the shipment may be delayed, the importer subjected to fines for false or inaccurate declarations, or if fraud is suspected the shipment may be confiscated. The contents of each package must be fully and explicitly entered on the invoice, with a separate listing for any advertising matter or similar articles, even though no charge is made for them.

Alteration or erasure renders the documents void. When an error is discovered, a letter of correction, in Spanish, must be presented to the consul, in triplicate. This letter should be certified by the consul, who returns one copy to the shipper, retains one copy, and sends one copy to the customs office in Chile. When short shipments occur, a letter of correction should be prepared and consular visa secured.

* In the case of c. i. f. quotations, the value to be declared on the consular invoice is that of the merchandise, without insurance, freight, or other charges. The value shown on the consular invoice need not, in such cases, agree with that of the commercial invoice.

³ Furnished by the Division of Foreign Tariffs, Bureau of Foreign and Domestic Commerce.

CONSULAR FEES

The fees for consular visa, including ship subsidy fees, are as follows:

For bill of lading on shipments under 200 tons (original)---	\$2. 20
For each additional 200 tons or fraction-----	2. 20
For invoice of goods under \$10 in value-----	No fee.
From \$10 to \$20-----	2. 20
From \$20 to \$200-----	5. 50
For any amount over \$200; 2.2 per cent of the excess value.	
For each extra bill of lading or invoice-----	2. 20
Letter of correction in triplicate-----	4. 40
For late certification of documents-----	3. 52

As Chilean importers have been accustomed to consider that c. i. f. quotations include payment of consular fees by the seller, it would be well for American exporters to have it stated explicitly in the sales contract whether or not their c. i. f. quotations include such payments.

LABELING, PACKING, AND MARKING

There are no special requirements with regard to the marking of country of origin on goods, or labeling of general merchandise, except that when merchandise or products are imported bearing labels which attribute to them qualities superior to those they actually possess, they will be subject to duty according to the description given on their labels.

Consideration must be given to the Chilean duties in packing goods for shipment to that country. Duties are levied, according to the commodity, on the gross weight, the net weight, or the weight including container or other packing (legal weight).

When goods dutiable on legal weight are imported loose in bulk or bundles, or without packing except the outside container, the net weight is subject to an increase of 10 per cent. When goods dutiable on gross weight are packed with other articles, the dutiable weight is increased from 10 to 80 per cent, according to the commodities. Goods packed in sacks or bags and requiring manual labor for handling may not enter or leave Chile if the weight is over 80 kilos (176 pounds) per parcel.

Hay and straw, and other forage, is forbidden for use in packing goods shipped to Chile, except for packing glass, crystal, and china, when the packing must be sterilized at 115° F., and the shipment accompanied by a certificate issued by competent sanitary authority and visaed by a Chilean consul.

Packages must be stenciled (marking with a brush is not permitted) to show the shipping marks and numbers, and the gross weight in kilos of each package.

SHIPPING BY MAIL

Packages weighing up to 22 pounds may be sent to Chile by parcel post and may be registered. Two copies of the customs declarations are required, and two copies of the consular invoice must accompany the packages in order to avoid a fine for the importer. A surtax of 15 per cent of the import duties is levied on merchandise entering by parcel post.

Dutiable matter may be sent by the letter mails to Chile if marked with the usual green label furnished by the post office and accompanied by a customs declaration.

SAMPLES

Samples of no commercial value may be sent by sample post up to a limit of 18 ounces in weight, and 12 by 8 by 4 inches in size. Samples so sent are exempt from documentary requirements and customs formalities and take a low rate of postage. They should be marked "Muestras sin valor," and must be packed in such a way as to permit of easy inspection. Samples sent by parcel post, by express, or by freight are subject to the documentary requirements for ordinary commercial shipments sent in such a way. Samples obviously of no commercial value are admitted free of duty; samples of commercial value are subject to the regular duties ordinarily applying to commercial shipments of similar articles. Samples which would otherwise be dutiable are accorded duty-free admission if so mutilated as to be unsalable.

Commercial travelers' samples carried as baggage may be entered without a consular invoice but the regular consular fee must be paid at the port of entry. Detailed declaration of any goods which may not be classified as personal baggage must be made on forms furnished by the captain of the ship or the conductor of the train.

Samples of commercial value may be imported into Chile for a period of six months, upon security furnished by a local business house of good standing to cover the full amount of duty to which the samples would be subject as merchandise, or upon a cash deposit of equal amount by the importer. Samples without commercial value, or samples of commercial value but mutilated so as to render them unsalable, are admitted free of duty without any restriction as to reexportation.

Samples carried by commercial travelers may be taken back and forth across the borders of Chile, provided they are submitted for identification and export permit when taken out, and upon reimportation, correspond exactly to the distinguishing notations on the export permit, although the quantity may be less than that exported. A bond guaranteeing the import duties payable on the samples must be presented, which will be canceled when the reimportation is approved.

TRANSIT SHIPMENTS

The treatment of transit shipments for Bolivia is governed by a treaty between Chile and Bolivia. Goods must be clearly marked "En tránsito a Bolivia" and may be stored without charge for one year in Chilean warehouses or transferred to railroad cars to be shipped in bond to the customhouse in Bolivia. A waybill in triplicate is required and a guaranty for the estimated amount of the duties under the Chilean tariff, which is canceled upon receipt, within 40 days, of a certificate signed by the collector of customs at the Bolivian office to which the goods were sent. Goods in transit for Bolivia must be manifested by the vessel and the importer for the Chilean customs.

ENTRY AND WAREHOUSING

Goods unloaded directly on the wharves are entered into the customs immediately. Goods unloaded in other ways must be entered within 48 hours after unloading. Goods may be warehoused for not more than one year. Parts of shipments of goods may be placed in warehouse at different times, subject to an increased fee of 10 per cent, payable after the entire shipment has been deposited. Part of

a shipment may be withdrawn from the customs warehouse and entered upon the payment of the duty only on the portion withdrawn; the duties upon this portion, however, being increased by 10 per cent. This 10 per cent is returnable after the entire shipment has been entered. A period of six months is allowed importers for the presentation of consular invoices at Chilean customs.

FINES AND IRREGULARITIES

Failure to declare goods, falsification of documents, and concealment of goods, to avoid payment of duty, are punishable by fines of not more than five times the value of the goods, or imprisonment for not more than five years, or both.

When the actual weight of imported goods is shown to be 5 per cent less or 10 per cent greater than the declared weight (the legal tolerance), a fine equivalent to the duty on the difference is assessed, provided that the discrepancy in weight is not due to leakage, theft, evaporation, or breakage. When all or part of a shipment is shown to be dutiable at lower rates than those indicated in the declaration, the importer is liable to a fine of 10 per cent of the duty on the difference. If all or part of a shipment proves, upon examination, to be subject to higher duties than those shown in the declaration, a fine of twice the amount of the duty on the difference is assessed, in addition to the regular duties. When all or part of a shipment is found to differ in character from the goods listed in the documents, even though the actual goods and the declared goods are subject to the same duties, a fine is assessed amounting to 1 per cent of the regular duties, in addition to the regular duties.

APPEALS AND CLAIMS—ABANDONED GOODS

Claims involving amounts of not more than 500 pesos are settled finally by customs administrators who also have original jurisdiction over claims involving over 500 and not more than 1,000 pesos. The superintendent of customs has original jurisdiction over claims involving more than 1,000 but not over 5,000 pesos, and also hears appeals from decisions of the customs administrators in cases involving over 500 but not more than 1,000 pesos. The general customs board has original jurisdiction in cases involving more than 5,000 pesos, and also hears appeals from decisions of the superintendent of customs in cases involving over 1,000 pesos. All decisions of the general customs board are final. Appeals from decisions of customs administrators and the superintendent of customs must be filed within four working days after notice of the decision is received. No time limit is specified for presenting appeals to the general customs board. Claims must be drawn up in due legal form. The customs authorities are allowed four days in which to determine the validity of a claim. If the case appears to merit a hearing, a period of not more than 10 days after the expiration of the first 10-day period will be granted. Goods may be abandoned in the customs by the owner, provided they are not subject to a fine or penalty, and may be redeemed upon payment of all duties and fees. Abandoned goods are subject to sale at public auction under conditions specified by the general customs board.

Since the locations and jurisdiction of foreign consulates in the United States are subject to change at irregular intervals, it is inadvisable to present such locations in this publication. Concerns that

do not find a Chilean consulate listed in the telephone directory of their home city may learn of the location of the nearest consulate by addressing either the consulate general of Chile in New York City, or the Department of Commerce, Washington, D. C.

TARIFFS

Duties on imports are assessed on specific values. During the past few years there has been a decided trend toward the revision upward of the Chilean tariff. This has been strongly supported by Chilean manufacturers, although commercial interests feel that an increase would react unfavorably on Chilean commerce. In spite of this fact, on January 1, 1928, a new import tariff was enacted which revised upward the duties on all articles now produced in Chile and which were not considered to have sufficient protection.

The following statement shows the rate of import duties in effect on railway equipment on March 1, 1930:

	Peso per gross kilo
Steam boilers not otherwise specified.....	0. 35
Pipes and tubes, for steam boilers or for condensers, of copper and its alloys.....	. 30
Pipes and tubes, for steam boilers or for condensers, of iron and its alloys.....	. 10
Transmission straps and bands even when imported with the machinery to which they belong, and thongs of leather for connecting them.....	1. 20
Other straps and bands, not otherwise specified.....	1. 50
Untarred felt for boiler packing.....	. 60
Injectors for feeding boilers.....	. 30
Explosion motors.....	. 10
Steam motors.....	. 10
Wind motors.....	. 10
Electric motors.....	. 10
Motors not otherwise specified.....	. 10
Turbines.....	. 10
Piece, and repair parts for machinery.....	. 25
Machinery, apparatus, pieces of machinery and accessories for supplying electric force for industrial application.....	. 10
Cable railways, their machinery and parts not otherwise specified.....	. 10
Lifts or elevators for persons or merchandise and their ma- chinery and parts not otherwise specified.....	. 20
Autocars or rail motor cars.....	2. 00
Bogies of iron and steel.....	. 50
Shifts, crossings, splicing of railways (probably trestles and switches).....	. 40
Railway cars for baggage or merchandise and those with tanks for liquids.....	. 30
Railway cars for provisional railways or portable railways (of Decauville system and others) and those for cableways including hand cars for railways.....	. 30
Railroad spikes.....	. 30
Passenger coaches, including dining cars, and tourists' cars not otherwise specified.....	. 50
Coupling pins, clamps, staples, seat plates, and other material not otherwise specified for permanent railways.....	. 20
Air brakes.....	. 30
Locomotives and tenders.....	. 10
Pieces of iron such as link chains, hand brakes, springs, buffers, and lubricators and other pieces not otherwise specified.....	. 50
Rails for railways.....	. 05
Railway wheels, axles, and tires.....	. 10

Wheels for cars, with or without axles, and centers of wheels for cars whether Decauville cars, cars for mines, aerial cars, and others similar, the weight of each not exceeding 50 kilograms each piece.....	Peso per gross kilo 0.30
Turntables and revolving platforms.....	.30
Screws, ball extractors, bolts, hinges, joints.....	.90
Tramways or street cars.....	.50
Cross pieces or ties of iron and steel.....	.15
Pieces and repair parts of machinery for railways, not otherwise specified.....	.25
Surtaxes, 0.10 peso per 100 gross kilos.	

NOTE.—Motors imported with machines which are dutiable at higher rates become subject to the rate of the more highly dutiable machines.

TRANSPORTATION AND COMMUNICATION

SHIPPING

Due to its 2,900 miles of sea coast, water transportation is necessary to its existence in view of the configuration of its coast line. During the calendar year ended December 31, 1928, 1,003 ships of 3,188,400 net tons entered Chilean ports in foreign trade. On June 30, 1929, the Chilean merchant marine consisted of 96 steamers of 142,051 gross tons, 12 motor ships of 2,369 gross tons, and 11 sailing vessels of 10,143 gross tons, totaling 119 vessels of 154,563 gross tons. Coastwise traffic is reserved to vessels of Chilean nationality. This has accomplished much in stimulating the coastwise traffic. Its ports are well served by transoceanic lines offering service to all ports of the world.

INLAND WATERWAYS

Chile has 1,368 kilometers of navigable rivers and streams and has also in operation 805 kilometers of lake steamship routes. As a rule, however, inland waterway navigation plays little part in the transportation system of this country, owing for the most part to the extended seacoast and 108 kilometer width of the country.

RAILWAYS

Because of the topography of the country, Chile is forced to depend on railways as its chief means of transportation. The railway system is built around the State Railways and the Northern Longitudinal, which provide trunk lines extending practically from one end of Chile to the other. Feeder lines are made up for the most part of nitrate and mining railways which in addition to carrying freight, also afford passenger transportation. In all, Chile is well served by its railways. The development of new transandine routes would facilitate shipments and open areas that at this time are undeveloped owing to the lack of interior transportation. Their construction is needed.

HIGHWAYS

In 1928, Chile had 39,977 kilometers (1 kilometer=0.62137 mile) of highways, of which amount 36,402 kilometers were of earth, sand clay, or gravel; 3,520 kilometers of water-bound macadam, and 55 kilometers of other types. During 1928 it is estimated that 61,932,287 pesos were spent on new construction and maintenance. Likewise the largest road construction program ever undertaken by the Chilean Government was initiated. Contracts amounting to 49,650,000 pesos were awarded for the construction or improvement of 974 kilometers of roads. Of this amount, contracts amounting to 11,834,211 pesos were completed during the year while it is estimated

that 22,263,000 pesos will be spent in 1929, on the above contracts, and new contracts to be awarded in 1929 will aggregate approximately 44,369,331 pesos for work on 602 kilometers of road.

In 1928, a new program of highway construction was mapped out providing for the expenditure of 90,000,000 pesos which will be provided by internal and external loans. The general provisions of this expenditure will be decided by the Executive, but in general they must fall within the following five categories:

(1) Roads giving access to consuming centers or between different consuming centers; (2) roads giving access to railway centers; (3) roads to ports; (4) a longitudinal highway; and (5) other highways.

AERIAL CABLEWAYS

Aerial cableways until very recently were not used to any great extent in Chile, particularly for passenger transportation. For some time cableway installations for handling ore as feeders to railway lines have been operated successfully. The geographic conditions and configuration of the country is such that additional installations of cableways would prove decidedly advantageous to the present transportation system. What apparently was the first passenger aerial cableway in Chile is the Cerro San Cristobal Cable Railway (Funicular San Cristobal of Santiago). This is a 1-kilometer line of single cable and was designed entirely for passenger traffic.

AVIATION

Aviation developments in Chile really commenced in 1929. At the beginning of the calendar year there was no regular commercial air services in operation. In January the Chilean Army Air Service inaugurated a regular air mail service between Santiago and Arica, touching at the principal points between these two cities. In July, the Latecoere Air Mail Service between Argentina and France was extended to Chile. In September, the Pan American Grace Airways (Inc.), extended their air mail service southward to Santiago and in October continued it to Buenos Aires. In September, the New York, Rio Janeiro, and Buenos Aires air line inaugurated a weekly passenger, mail, and freight service between Buenos Aires and Santiago. While aviation still is in its infancy in this country, it can be seen that in the inauguration of these services a good initial start has been made.

COMMUNICATIONS

Telegraph, telephone, and wireless are the chief means of domestic communication, while cable and radio are the principal methods used for seacoast and overseas communications. Cables are sent directly both from the west coast and east by land telegraph across Argentina to the coast. The telegraph lines are owned both by private interests and the state. The wireless system is Government owned and controlled by the Navy Department.

Radio facilities are gradually being installed. In January, 1929, two radio stations were established by private companies to offer international communications service to the public. The Government is actively engaged in modernizing the service of communications throughout the country. New lines are being constantly added and it is expected shortly that a complete reorganization of the technical service will take place.

THE RAILWAY EQUIPMENT MARKET

In considering the Chilean market for railway equipment there are several conditions which should be thoroughly understood by a manufacturer before he determines his selling program. In any foreign market survey, the supply is gaged by the existing market demands as limited by domestic production. In the present case this latter is negligible and applies for the most part to minor manufactures, replacements, and in the case of the State Railways, a small amount of rolling stock.

Because of the wide diversity of purchases, and the details connected with submitting tenders on Chilean State Railway solicitations, it is essential that a manufacturer be represented in Chile by an agent. It is also advisable that this agent have on hand stocks of replacement parts and minor railway equipment pieces, in order to meet emergency orders. There should be a thorough understanding between the agent and the exporter pertaining to the agency agreement. In particular, the status of the agent should be indicated when orders are secured through the New York or London offices of the various independent and industrial railways.

The market demands consist in supplying replacements for approximately 10,600 kilometers of track, 1,307 locomotives, and 20,547 pieces of rolling stock, and, in addition, yearly purchases of new equipment for from 1 to 400 kilometers of track and a corresponding proportionate increase in operating equipment. Equipment needed by a few industrial lines operated in connection with mining properties adds to the above demands. According to the railway classifications in Chilean Government statistics the total value of imports of railway equipment during the 10-year period 1918 to 1927 amounted to approximately 403,000,000 pesos, or an average of slightly more than 40,000,000 pesos per year. Undoubtedly some additional equipment entered the country under other than the railway classifications.

Considering this prospective market, British capital controls the purchasing of about 22 per cent of the right of way material, 20 per cent of the locomotives, and 31 per cent of the rolling stock. This percentage is purchased through London and is destined for British owned or operated railways. Generally it is all British material, but in certain instances American equipment has been purchased. It might be advisable to point out that American railway equipment manufacturers should have their London agents keep in touch with the engineering organizations of Fox & Mayo, 115 Dashwood House, New Broad Street, E. C., London, and Livesey Son & Henderson, 14 South Place, Finsbury, E. C. 2, London, who, as part of their duties, pass judgment on practically all equipment purchased for British-owned foreign railways, particularly in South America.

American capital controls the purchasing of about 3 per cent of the right of way material, 7 per cent of the locomotives, and 5 per cent of the rolling stock. This equipment is purchased in New York for the use of American owned or operated railways.

Chilean capital controls the purchasing of the remainder, or about 75 per cent of the right of way material, 73 per cent of the locomotives, and 64 per cent of the rolling stock. Practically all this equipment is purchased by means of public tender, solicited through the purchasing office of the State Railways at Santiago. In certain instances minor purchases or emergency major purchases are made direct, with the approval of the council. Since the first of 1928, the Arica-La Paz Railway has been placing all its orders through its purchasing office at Arica, while the Puente Alto-Volcan Railway, which is administered directly by the Minister of War, secures its requirements through the War Department.

The railway equipment import statistics are grouped in 28 classifications. Of the total imports of about 403,000,000 pesos, steam locomotives, valued at approximately 93,000,000 pesos, represented 23 per cent, steel rails approximated 83,000,000 pesos or 20 per cent, freight cars close to 52,000,000 pesos or 12 per cent, and car wheels nearly 27,000,000 pesos or 6 per cent.

Considering the value of steam-locomotive imports during this 10-year period, it is noted that approximately 70,000,000 pesos, or 76 per cent, were furnished by the United States, 18,000,000 pesos, or 20 per cent, by Great Britain, while other locomotive imports were received from Germany, Belgium, Sweden, and Netherlands.

Shipments of steel rails during the 10-year period amounted to 83,000,000 pesos. Of this amount Belgium supplied approximately 33,000,000 pesos, or 39 per cent, and the United States approximately 32,000,000 pesos, or 38 per cent. Other exporting countries in order of relative importance were Germany, Great Britain, France, and Netherlands; several other countries supplied small quantities. Total freight-car imports during the same period were valued at approximately 52,000,000 pesos. Of this total about 28,000,000 pesos, or 54 per cent, were shipped from the United States; 12,000,000 pesos, or 24 per cent, from Belgium; 6,000,000 pesos, or 11 per cent, from Great Britain, while the remainder was composed of small shipments from other producing countries. Car wheels imported were valued at approximately 27,000,000 pesos during this period. Imports valued at about 11,400,000 pesos, or 42 per cent, were received from the United States; 7,200,000 pesos, or 26 per cent, from Belgium; 5,800,000 pesos, or 21 per cent, from Great Britain; 2,000,000 pesos, or 7 per cent, from Germany, while minor shipments were received from Holland, Spain, and Czechoslovakia.

The following table shows the total value of each railway-equipment commodity imported by Chile from all countries of origin for the calendar years 1918 to 1927, inclusive. For basic data showing imports of railway equipment, by commodity and country of origin, see Appendix B.

TOTAL COMMODITY VALUE OF RAILWAY EQUIPMENT IMPORTED BY CHILE FROM ALL COUNTRIES OF ORIGIN DURING THE CALENDAR YEARS 1918 TO 1927, INCLUSIVE

[Value in Chilean pesos]

Commodity	Argentina	Belgium	Bolivia	France	Germany	Great Britain
(a) Steam locomotives and tenders ¹	39,690	142,188	425,238	-----	4,685,285	17,679,601
Electric locomotives and parts ¹	-----	-----	-----	-----	590,501	380,522
(b) Springs for locomotives and tenders.....	-----	37,194	-----	-----	143,532	801,085
Freight cars.....	451,200	12,342,532	146,250	28,500	4,329,533	5,662,070
Passenger cars.....	-----	-----	-----	-----	7,653,729	2,577,781
Tank cars.....	-----	1,512,405	-----	-----	-----	92,160
Motor rail cars.....	-----	-----	-----	-----	-----	479,695
Hand cars.....	-----	3,063	-----	166	719,769	1,990
(c) Portable and aerial cableway cars.....	870	299,598	95,340	1,473	4,981,312	2,651,649
Tramways.....	1,179,660	69,000	-----	-----	30,780	28,216
(d) Iron parts for railway cars.....	-----	1,652,457	783	1,380	474,766	2,774,545
Iron parts for aerial line cars.....	-----	154,269	-----	-----	361,255	468,837
Car springs.....	10,389	369,640	-----	14,676	353,086	1,183,542
(e) Car wheels.....	8,610	7,267,232	18,339	600	2,016,578	5,854,856
Car buffers.....	2,400	1,028,891	-----	-----	143,922	677,166
Steel bogies.....	2,400	-----	51,012	-----	2,760	92,358
Car brakes.....	-----	185,275	11,225	1,200	17,702	815,694
Journal boxes for railway car wheels.....	6,834	150,925	624	-----	120,430	499,838
(f) Chain couplings.....	-----	305,777	-----	-----	20,698	215,887
(g) Rails.....	38,359	32,812,324	-----	1,543,453	8,500,281	6,978,567
Special rail spikes.....	52,590	3,679,126	38,442	11,775	1,165,456	1,389,507
Turntables.....	6,000	69,510	7,695	-----	97,352	123,463
Special screws and bolts.....	-----	1,373,801	2,877	2,880	233,673	1,365,057
Junction or bridge plates.....	16,450	13,918,595	68,655	48,795	1,831,801	1,024,005
Iron or steel beams and ties ⁹	-----	435,924	-----	-----	129,827	72,685
(h) Crossties ¹⁰	-----	264,000	-----	-----	87,735	98,625
Switches.....	1,950	507,571	-----	2,400	216,406	1,184,529
(i) Other railway materials and tools.....	7,430	4,662,371	19,929	3,348	906,402	8,079,528
Total.....	1,824,832	83,243,668	886,409	1,660,646	39,814,571	63,253,458
Percentage of total value.....	0.45	20.66	0.22	0.41	9.88	15.75

See footnotes on p. 25.

TOTAL COMMODITY VALUE OF RAILWAY EQUIPMENT IMPORTED BY CHILE FROM ALL COUNTRIES OF ORIGIN DURING THE CALENDAR YEARS 1918 TO 1927, INCLUSIVE—Continued

[Value in Chilean pesos]

Commodity	Nether-lands	Sweden	United States	Total value	Per cent of total value
(a) Steam locomotives and tenders ¹	86,527	106,941	69,642,036	² 92,886,529	23.06
Electric locomotives and parts ¹	-----	-----	12,039,116	13,010,139	3.23
(b) Springs for locomotives and tenders.....	528	-----	663,788	³ 1,647,452	.41
Freight cars.....	370,712	-----	28,289,092	51,619,889	12.81
Passenger cars.....	-----	-----	1,335,512	11,567,022	2.87
Tank cars.....	2,160	-----	991,224	2,597,949	.64
Motor rail cars.....	-----	-----	61,967	541,662	.11
Hand cars.....	11,955	-----	97,998	834,941	.21
(c) Portable and aerial cableway cars.....	548,272	-----	3,422,185	⁴ 12,009,249	2.98
Tramways.....	-----	-----	2,600,740	3,908,396	.97
(d) Iron parts for railway cars.....	41,940	5,718	6,479,371	⁵ 11,431,190	2.84
Iron parts for aerial line cars.....	-----	-----	117,873	1,102,234	.27
Car springs.....	10,351	-----	1,082,843	3,024,527	.75
(e) Car wheels.....	395,653	-----	11,414,274	⁶ 26,984,842	6.70
Car buffers.....	3,732	-----	2,107,848	3,963,959	.98
Steel bogies.....	-----	-----	1,213,021	1,361,551	.43
Car brakes.....	-----	-----	5,305,774	6,336,870	1.57
Journal boxes for railway car wheels.....	18,236	18	385,583	1,182,488	.29
(f) Chain couplings.....	-----	-----	238,594	⁷ 781,256	.19
(g) Rails.....	1,267,703	-----	31,958,844	⁸ 83,168,516	20.65
Special rail spikes.....	308,021	-----	2,747,678	9,392,595	2.33
Turntables.....	-----	-----	68,394	372,414	.09
Special screws and bolts.....	62,853	1,104	1,242,649	4,284,894	1.06
Junction or bridge plates.....	183,096	48	7,007,583	24,099,028	5.98
Iron or steel beams and ties ⁹	253,323	-----	245,238	1,136,997	.28
(h) Crossties ¹⁰	-----	-----	278,111	¹¹ 728,696	.18
Switches.....	19,413	-----	2,164,253	4,096,522	1.01
(i) Other railway materials and tools.....	33,695	2,880	14,770,428	¹² 28,670,181	7.11
Total.....	3,618,170	116,709	207,972,017	402,741,988	100
Percentage of total value.....	0.89	0.03	51.63	100	-----

¹ These data include electric locomotives prior to 1924.

² Includes shipments from Italy valued at 9,123 pesos, and Peru 69,900 pesos.

³ Includes shipments from Switzerland valued at 1,325 pesos.

⁴ Includes shipments from Austria valued at 6,000 pesos, and Peru 2,550 pesos.

⁵ Includes shipments from Panama valued at 230 pesos.

⁶ Includes shipments from Czechoslovakia valued at 960 pesos; Peru, 1,140 pesos; and Spain, 6,600 pesos.

⁷ Includes shipments from Peru valued at 300 pesos.

⁸ Includes shipments from Denmark valued at 62,400 pesos, and Italy, 6,585 pesos.

⁹ This classification not in existence prior to 1923.

¹⁰ Classification evidently changed in 1922 and since that year part of the commodity is shown under the classification "Iron and steel beams and ties" (see footnote 9), while some of it is included under forest products.

¹¹ Includes shipments from Peru valued at 225 pesos.

¹² Includes shipments from Denmark valued at 184,170 pesos.

During the 10-year period 1918 to 1927, inclusive, the United States shipped approximately 51 per cent of the total value of Chilean railway equipment imports, followed in relative importance by Belgium with 20 per cent; Great Britain, 15 per cent; and Germany, 9 per cent. All other countries sent less than 1 per cent.

The year 1924 led all other years of the 10-year period in the import value of railway equipment when about 16 per cent of the total entered Chile. During this period railway equipment imports fluctuated, by years, from 4.2 per cent of the total value to 9.4 per cent. All years were more than double that of 1918, except 1920, when but 6.2 per cent of the total imports entered. The years 1925, 1926, and 1927 showed approximately the same amount of railway equipment entering each year, which amounted to about 10 per cent per year of the total imports for the period.

The following table shows the total value of railway equipment imported, by countries of origin, during the calendar years 1918 to 1927, inclusive. For basic data showing imports of each commodity by year see Appendix B.

TOTAL VALUE OF RAILWAY EQUIPMENT, BY COUNTRIES OF ORIGIN, IMPORTED BY CHILE DURING THE CALENDAR YEARS 1918-1927, INCLUSIVE

[Value in Chilean pesos]

Country	1918	1919	1920	1921	1922	1923
Argentina.....	336,936	41,613	241,140	53,100	13,719	965,160
Austria.....				6,000		
Belgium.....			620,103	4,685,427	4,771,653	14,063,790
Bolivia.....	50,358	392,262	7,494	129	95,340	181,392
Czechoslovakia.....						960
Denmark.....				62,400	184,170	
France.....			12,330	7,926	1,395,264	44,730
Germany.....	4,746		2,339,343	6,148,872	6,592,062	1,891,917
Great Britain.....	3,084,102	3,212,580	6,087,168	9,421,578	2,865,696	3,201,141
Netherlands.....			336,441	302,682	100,350	57,063
Peru.....		300	3,690			
Spain.....			6,600			
Sweden.....	68,082		18		2,880	
United States.....	13,374,233	33,022,108	15,672,063	14,181,276	22,282,016	37,432,683
Total.....	16,918,457	36,668,863	25,326,390	34,869,390	38,303,150	57,838,836
Percentage of total imports for 10-year period.....	4.2	9.1	6.2	8.6	9.4	14.4

Country	1924	1925	1926	1927	Total	Percentage of total imports for 10-year period
Argentina.....		167,769	1,000	4,395	1,824,832	0.45
Austria.....					6,000	0
Belgium.....	26,559,779	9,214,510	6,453,810	16,874,596	83,243,668	20.66
Bolivia.....	117,420	16,050	25,964		886,409	.22
Czechoslovakia.....					960	0
Denmark.....					246,570	.06
France.....	46,707	148,245	2,378	3,066	1,660,646	.41
Germany.....	13,413,546	4,503,831	2,973,364	1,946,890	39,814,571	9.88
Great Britain.....	11,106,216	7,704,441	8,048,585	8,521,951	63,253,458	15.75
Netherlands.....	481,935	942,963	965,549	431,187	3,618,170	.89
Italy.....	6,585	9,123			15,708	0
Panama.....				230	230	0
Peru.....	70,125				74,115	.02
Spain.....					6,600	0
Sweden.....	2,361	48	42,216	1,104	116,709	.03
Switzerland.....				1,325	1,325	0
United States.....	13,710,138	20,619,768	21,988,444	15,689,288	207,972,017	51.63
Total.....	65,514,812	43,326,748	40,501,310	43,474,032	402,741,988	
Percentage of total imports for 10-year period.....	16.2	10.7	10.4	10.8	100	100

LOCOMOTIVES

Locomotives of many types, makes, sizes, and descriptions, representing nine manufacturing countries, are now in operation in Chile. They are of various colors, some bright and decorated and others with many brass trimmings, but all neat in appearance. Since 1919 efforts have been made by the State Railways to establish as standard the Mikado 70 type, for freight locomotives, and more recently some

consideration has been given to the selection of a standard type for passenger service. While no definite action has yet been taken, it is thought that either the Mountain or Pacific type will eventually be adopted.

Locomotives are all of foreign construction, although recently there has been some experimenting with their erection in local shops and foundries, using only such materials from abroad as were necessary. This of course applies only to the State Railways. The independent railways still purchase their entire needs abroad, with the nationality of the railway controlling the purchase. It is only since 1924 that electric locomotives appear in Chilean import statistics and but few were imported before that year. The electrification of certain sections of the State Railways and the Transandean Railway was responsible for increasing the importation of electric locomotives, until in 1927 the value of these imports exceeded by 400,000 pesos the total imports of steam locomotives, and represented slightly more than 50 per cent of total locomotives imported during that year. While separate specifications are prepared for each new locomotive purchased, there is wide diversity of such items as heating surface, size of wheels, etc., owing to the types built by the successful tenderer. This direct effort toward standardization pertains only to the State Railways system as practically all other railways are buying equipment in accordance with their needs and ability to pay, and even used locomotives have been imported.

During the 10-year period, 1918 to 1927, Chile imported locomotives and locomotive parts valued at approximately 108,000,000 pesos. Included in these imports by classifications, according to Chilean import statistics, are steam locomotives and parts, electric locomotives and parts, and springs for locomotives.

Of the total value of imports steam locomotives comprised 86 per cent, or 93,000,000 pesos, while electric locomotives (four years only) were valued at 13,000,000 pesos, or 12 per cent. During the year 1923, locomotives and parts valued at 30,000,000 pesos, or 28 per cent of the total value were imported. This was the peak year for the 10-year period. In 1918 these imports amounted to approximately 4,000,000 pesos and with the exception of 1921, when 5,000,000 pesos of locomotive imports were entered, all other years increased by more than double the value of 1918. It is interesting to note that there was scarcely any difference in the value of imports between steam and electric locomotives for the years 1926 and 1927. The balance which was slightly in favor of steam locomotives in 1926 was counterbalanced by electric locomotive imports in 1927. It is doubtful if this 1927 electric locomotive balance will continue during the next few years in view of the limited electrification program.

Reviewing the total value of locomotive imports during the period under discussion the United States shipped 76 per cent, or about 82,000,000 pesos; Great Britain 17 per cent, or approximately 19,000,000 pesos; and Germany 5 per cent, or about 5,000,000 pesos. These were the largest shipping countries. Deliveries were also received from Belgium, Netherlands, Italy, Sweden, and Switzerland, as well as reshipments of unknown origin from other Latin-American countries.

The following table shows the weight and value of locomotives and locomotive parts imported by Chile during the 10-year period 1918 to 1927, inclusive:

WEIGHT AND VALUE OF LOCOMOTIVES AND LOCOMOTIVE PARTS IMPORTED DURING 10-YEAR PERIOD, 1918 TO 1927

Year	Steam locomotives and parts		Electric locomotives and parts ¹		Springs for locomotives		Total	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value
	<i>Kilos</i>	<i>Pesos</i>	<i>Kilos</i>	<i>Pesos</i>	<i>Kilos</i>	<i>Pesos</i>	<i>Kilos</i>	<i>Pesos</i>
1918.....	889,803	3,520,836	-----	-----	33,551	113,538	923,354	3,634,374
1919.....	2,954,321	12,403,299	-----	-----	6,545	29,937	2,960,866	12,433,236
1920.....	1,866,272	7,855,956	-----	-----	37,471	125,331	1,903,743	7,981,287
1921.....	758,922	4,431,861	-----	-----	55,648	334,953	814,570	4,766,814
1922.....	3,400,400	10,972,782	-----	-----	456,548	635,151	3,856,948	11,607,933
1923.....	7,913,572	30,293,826	-----	-----	9,081	27,651	7,922,653	30,321,477
1924.....	1,449,206	4,814,085	301,515	1,278,507	94,701	110,787	1,845,422	6,203,379
1925.....	3,306,852	8,764,176	428,675	2,001,789	84,956	144,786	3,820,483	10,910,751
1926.....	2,060,494	5,826,466	1,190,204	5,286,827	19,048	54,503	3,269,746	11,167,796
1927.....	1,210,876	4,003,242	548,975	4,443,016	29,083	70,815	2,088,934	8,517,073
Total...	25,810,718	92,886,529	2,769,369	13,010,139	826,632	1,647,452	29,406,719	107,544,120

¹ The first year in which these data were available was 1924.

ROLLING STOCK

Rolling stock on Chilean railways formerly resembled as heterogeneous a collection of equipment as could be found in any country. Many types and sizes of cars, representing almost all rolling-stock manufacturing countries, ranging from four to eight wheel types, built of wood, pressed steel, or steel skeletons with wooden linings, were to be found. Link and pin couplers were used almost entirely, but are rapidly being replaced by the automatic coupler, particularly on the State Railways.

Modern methods of car construction and standardization are being inaugurated. Practically all new passenger cars purchased by the State Railways are of steel body and frame construction. These are for the most part of foreign manufacture, but the local shops are commencing to offer strong competition. Again on the State Railways, we find that with the exception of some 8, 12, and 16 ton freight cars, practically all are now of steel frame, while most of the gondola and box cars above 16-ton capacity are of steel body construction.

The old rolling stock is equipped with the spoke type of wheel with separate tires, but the present policy is toward rolled steel wheels with a thick rim, which after turnings and removal of flanges can be used as a center for applying tires. Although the European type of spoke car wheel is still given preference in local car construction and is being imported to replace worn-out wheels, the standard American type of rolled steel and steel centered wheels are fast being installed. During the 10-year period, 1918 to 1927, car wheels valued at approximately 27,000,000 pesos were imported. Of this amount, the United States shipped 42.2 per cent, valued at about 11,400,000 pesos; Belgium 26.6 per cent, valued at 7,200,000 pesos; Great Britain 21.5 per cent, valued at 5,800,000 pesos; and Germany 7.4 per cent, valued at 2,000,000 pesos; leaving less than 3 per cent valued at less than 1,000,000 pesos to be contributed by other countries.

Recently the local shops of the Chilean State Railways have been constructing practically all freight cars for their own use. However, this does not hold true for either the independent or mining railways,

as in most instances their supply is imported from the country in which the railway is capitalized.

Car parts and accessories (excluding car wheels) imported during the 10-year period, 1918 to 1927, amounted to approximately 29,000,000 pesos. Of this amount 55 per cent, valued at about 17,000,000 pesos, was received from the United States; 24 per cent, valued at 6,700,000 pesos, from Great Britain; and 12 per cent, valued at 3,800,000 pesos, from Belgium. Other countries contributing to this total included Germany, Netherlands, France, and Sweden. In addition there were reexports from certain Latin countries the origin of which is not known.

The rolling-stock market during the years 1918 to 1927, inclusive, amounted to 83,000,000 pesos. Of course, this excludes all local production. Of this amount, the United States shipped equipment valued at approximately 36,800,000 pesos, or 44 per cent; Germany, about 18,000,000 pesos, or 21 per cent; and Belgium, 14,000,000 pesos, or 17 per cent. In addition Austria, France, Great Britain, and Netherlands also shipped to this market.

Chilean statistics segregate the imports of rolling stock into the following classifications: Freight cars, passenger cars, tank cars, motor rail cars, cars for portable and aerial cableways, and tramways. Of these various classifications it will be noted from the following table that the value of freight cars imported during this period was approximately 52,000,000 pesos, or 62 per cent of the total value of imports of rolling stock. Portable and aerial cableway cars valued at approximately 12,000,000 pesos, or 14 per cent, and passenger cars valued at approximately 11,500,000 pesos, or 13 per cent, were the next leading commodities.

The year 1926 exceeded all others in the value of rolling-stock imports, which amounted to approximately 15,000,000 pesos, or 18 per cent of the total imports for the 10-year period. The year 1924 was not far behind, however, with total imports of 14,500,000 pesos, or 17 per cent of the total. In 1921 the value of imports practically doubled that of the previous year and five years later the total value of imports was again doubled. The imports of rolling stock receded in 1927 to approximately the import value of 1921.

The following table shows the imports by various rolling-stock classifications and by calendar years from 1918 to 1927, inclusive. In connection with this table Appendix B should be consulted for detailed data.

WEIGHT AND VALUE OF ROLLING STOCK IMPORTED BY CHILE DURING 10-YEAR PERIOD, 1918 TO 1927, INCLUSIVE

Year	Freight cars		Passenger cars		Tank cars		Motor rail cars	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value
	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>
1918.....	1,308,048	1,950,333	22,493	51,441			555	3,621
1919.....	167,094	198,933	29,567	64,788	168,190	280,622		
1920.....	1,517,190	1,977,777			285,029	407,319	1,899	20,700
1921.....	607,126	2,781,963	8,121	81,537	818,589	1,447,065	6,062	116,376
1922.....	5,225,190	5,989,664	277,461	608,400			5,601	66,036
1923.....	3,101,344	8,846,799	5,086	3,987	70,580	135,963	6,873	90,033
1924.....	2,977,795	3,910,782	2,980,128	7,650,240	4,682	6,249	10,569	88,614
1925.....	10,272,406	10,525,005			185,908	310,731	8,343	103,503
1926.....	9,282,552	9,595,288	567,086	2,576,309			2,825	2,900
1927.....	5,084,146	5,843,342	90,401	530,320			6,171	49,879
Total.....	39,542,891	51,619,889	3,960,343	11,537,022	1,522,978	2,597,949	48,898	541,662

WEIGHT AND VALUE OF ROLLING STOCK IMPORTED BY CHILE DURING 10-YEAR PERIOD, 1918 TO 1927, INCLUSIVE—Continued

Year	Hand cars		Portable and aerial cableway cars		Tramway cars		Total	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value
	Gross kilos	Pesos	Gross kilos	Pesos	Gross kilos	Pesos	Gross kilos	Pesos
1918			267, 817	687, 384	47, 840	216, 000	1, 646, 753	2, 908, 782
1919			626, 039	1, 569, 759	672	4, 998	991, 561	2, 129, 100
1920			636, 093	1, 408, 428	1, 960	3, 000	2, 442, 171	3, 817, 224
1921	140	750	1, 206, 039	3, 466, 998	3, 490	15, 000	2, 649, 567	7, 909, 689
1922			295, 086	635, 499			5, 803, 338	7, 299, 599
1923			233, 036	402, 750	496, 497	1, 133, 760	3, 903, 416	10, 613, 292
1924	686, 510	744, 693	1, 301, 365	1, 864, 053	68, 124	110, 793	8, 029, 173	14, 375, 424
1925	910	3, 063	1, 129, 687	1, 380, 951			11, 597, 254	12, 323, 253
1926	23, 711	79, 279	431, 504	479, 805	237, 899	1, 998, 548	10, 545, 577	14, 722, 129
1927	3, 173	7, 156	113, 409	123, 622	92, 191	42, 297	5, 389, 481	6, 980, 616
Total...	714, 434	834, 941	6, 240, 074	12, 009, 249	948, 673	3, 908, 396	52, 998, 291	83, 079, 108

REFRIGERATOR CARS

The State Railways are the only common carriers which offer refrigeration service to the shippers, and this service is furnished by 31 cars of 30-ton capacity, of American construction. Insulation consists of keystone insulation material $\frac{1}{2}$ inch thick, wepon sheet paper $1\frac{1}{2}$ inches thick, and felt or cork $1\frac{1}{2}$ inches thick. Ice boxes are at either end of the car and extend its entire width of 889 millimeters. These boxes are lined with galvanized iron and the floors are covered with galvanized iron sheets. Gratings 457 millimeters from the floor serve as stands for the ice. The refrigeration compartment is divided into several sections by galvanized wire partitions. Refrigeration is undertaken by circulating air behind these ice chambers. In the winter the cars are not refrigerated, and even in the summer refrigeration is not well regulated.

The principal commodities carried are milk, butter, fruits, fish and other sea food, and vegetables. The maximum haul is from Puerto Montt to Valparaiso, a distance of 1,265 kilometers. The minimum haul is from Puangue to Alameda (Santiago), a distance of 78 kilometers.

The Antofagasta & Bolivia Railway and the Arica & La Paz Railway sometimes use an ice box in their dining cars for preserving food requiring refrigeration, but make no effort to offer a commercial refrigeration service. Some of the other railways use roughly constructed ice boxes in which to haul perishable foods.

There are no refrigerating storage houses at any of the railway terminals, which is one of the great handicaps in shipping perishable food products in this country.

No use has yet been made of either ventilated cars or cars equipped with brine tanks.

TRACK EQUIPMENT

The 10,600 kilometers of track in Chile made up of seven different gages has created very unusual market conditions for track material. It is planned to eventually establish the 1-meter gage as standard for the entire country. At the end of the calendar year 1926 there were in operation 4,082 kilometers of 1.676 meter, 3,427 kilometers of

1-meter, 1,678 kilometers of 0.762-meter, 827 kilometers of 1.435-meter, 66 kilometers of 0.60-meter, and 63 kilometers of 0.75-meter gage track.

Grades along the right of way range up to 5 per cent. Some curves reach a minimum radius of 250 meters. There are about 665 large bridges, 12,352 culverts and small bridges, and 130 tunnels. These varying factors all create special conditions which require large and varied stocks of track accessories. As for example, there are 17 different lengths of steel rails with 45 varying weights, which are in use throughout the country. These lengths and weights are as follows:

Kilos per meter.

5.7 meters	8.12.
6.0 meters	16.
6.71 meters	25.
7 meters	25, 14, 12.
7.31 meters	18, 30.7, 17.8.
7.32 meters	17.5.
7.33 meters	25.
7.62 meters	20.3, 27.7.
7.68 meters	18.
8 meters	15, 15.5 (25 and 27 rack).
8.23 meters	25.
9.14 meters	28, 37.2, 18.
9.15 meters	27.3.
9.75 meters	32.2.
10 meters	20, 27.5, 30, 25, 40, 50, 37, 45, 34.8, 49.6.
10.06 meters	29, 18.2.
10.97 meters	42.1.
10.98 meters	25.
12 meters	55.

During the 10-year period 1918 to 1927 Chile imported railway track equipment valued at approximately 126,500,000 pesos. Belgium was the principal supplier of this equipment with shipments valued at 52,800,000 pesos, or about 42 per cent of the total imports for the 10-year period. This country was closely followed by the United States with exports valued at 45,500,000 pesos, or about 36 per cent, while Germany and Great Britain each furnished track equipment valued at about 12,000,000 pesos, or 9½ per cent of the total imports. Denmark, France, Netherlands, and Sweden contributed to the remainder.

The imports of track equipment are classified as follows: Rails, special rail spikes, turntables, special screws and bolts, junction or bridge plates, iron or steel beams and ties, and switches. Naturally, some other materials used in connection with track maintenance are included under other statistical classifications, but it is practically impossible to determine these amounts so they have been omitted. It is at least safe to assume that 126,500,000 pesos represents approximately 90 per cent of the value of track equipment imports during the 10-year period.

Of this amount 83,000,000 pesos, or nearly 66 per cent, is represented by shipments of steel rails; 24,000,000 pesos, or 19 per cent, by junction or bridge plates; 9,400,000 pesos, or 7½ per cent, by special rail spikes; while the remainder consists of turntables, special screws and bolts, iron and steel beams and ties, and switches. More track equipment was imported in 1924 than in any other year of the period, when imports valued at 30,400,000 pesos, or 24 per cent of the total,

were received. The year 1927 was the next high during the period when imports were valued at 19,800,000 pesos, or nearly 16 per cent of the total amount. From the table it can be seen that the low point reached in Chilean imports of railway track equipment in 1918 has not again been reached. In 1919 equipment imports were practically double that of the preceding year, and if an average were taken of the total imports per year for the 10-year period it would approximate the 1919 total. In 1926 the value of total imports dropped to 7,000,000 pesos, which was the lowest point reached since 1918.

The following table, showing the weight and value of imports of track equipment during the 10-year period 1918 to 1927, inclusive, should be studied in connection with Appendix B.

CHILEAN IMPORTS OF TRACK EQUIPMENT DURING 10-YEAR PERIOD 1918-1927, INCLUSIVE

Year	Rails		Special rail spikes		Turntables		Special screws and bolts	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value
	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>
1918.....	7,186,552	3,939,036	585,970	820,554	11,177	10,816	36,280	59,298
1919.....	11,960,739	8,371,845	929,383	1,236,258	6,743	12,645	194,646	168,567
1920.....	6,949,235	4,634,907	575,178	948,990	7,705	9,612	263,551	634,290
1921.....	11,091,365	6,776,856	583,531	937,713	26,611	69,180	307,423	683,076
1922.....	22,110,509	11,458,230	738,436	570,720	55,134	105,456	32,713	75,099
1923.....	10,727,671	6,220,188	750,534	641,424	27,708	69,348	179,519	193,362
1924.....	31,669,381	17,774,442	1,261,715	1,783,587	12,211	15,198	729,588	1,073,850
1925.....	14,079,441	6,490,461	755,984	644,067	8,312	4,530	448,702	578,964
1926.....	17,089,944	4,832,635	883,006	353,501	50,872	49,168	124,558	77,247
1927.....	21,584,079	12,669,916	1,398,032	1,455,781	17,054	26,462	635,119	741,141
Total..	154,448,916	83,168,516	8,461,769	9,392,595	223,527	372,414	2,952,099	4,284,894

Year	Junction or bridge plates		Iron or steel beams and ties ¹		Switches		Total	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value
	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>
1918.....	557,014	530,343	-----	-----	177,194	252,299	8,554,187	5,612,345
1919.....	1,727,400	1,660,332	-----	-----	155,066	284,829	14,973,977	11,734,476
1920.....	1,595,481	2,160,954	-----	-----	270,138	360,396	9,661,288	8,749,149
1921.....	749,710	833,916	-----	-----	565,291	867,417	13,323,931	10,168,158
1922.....	1,079,510	1,260,696	-----	-----	246,450	349,101	24,262,752	13,819,302
1923.....	2,695,958	2,066,079	96,756	80,712	85,789	155,667	14,563,935	9,426,780
1924.....	5,426,526	8,929,704	298,010	319,305	404,593	491,070	39,802,024	30,387,156
1925.....	1,470,366	1,374,582	227,288	184,293	300,770	488,109	17,320,863	9,765,006
1926.....	1,860,024	985,364	995,177	285,662	484,809	468,562	21,488,390	7,052,139
1927.....	2,426,182	4,297,058	809,840	267,025	300,313	379,072	27,170,619	19,836,455
Total..	19,588,171	24,099,028	2,427,071	1,136,997	3,020,413	4,096,522	191,121,966	126,550,966

¹ Classification commenced in 1923.

CROSSTIES

Chile does not offer a particularly good market for exporters of crossties, despite the fact that it uses a large number annually. During the 10-year period 1918 to 1927, inclusive, crossties valued at 728,696 pesos were imported. Of this amount, ties valued at 278,111 pesos, or 38 per cent, were received from the United States; 264,000 pesos, or 36 per cent, from Belgium; 98,625 pesos, or 14 per cent, from Great Britain; 87,735 pesos, or 12 per cent from Germany; and

225 pesos from Peru. The largest number of these ties were of wood although some were of steel.

Chile is normally an exporter of railway ties, particularly to Bolivia and Peru. The following table¹ indicates the exports and imports of railway crossties during the 10-year period 1918 to 1927, inclusive:

Year	Exports		Imports	
	Quantity	Value	Quantity	Value
	<i>Gross kilos</i>	<i>Pesos</i>	<i>Gross kilos</i>	<i>Pesos</i>
1918.....	4,814,900	1,166,322	49,808	35,517
1919.....	5,431,274	1,577,049	75,291	50,425
1920.....	5,275,521	839,682	109,633	128,784
1921.....	9,156,240	3,451,911	139,690	123,129
1922.....	10,077,698	3,891,534	124,531	297,825
1923.....	3,700,575	1,058,880	9,100	45,675
1924.....	4,585,751	920,037	115	225
1925.....	2,862,100	552,879		
1926.....	2,837,177	391,996	12,605	47,116
1927.....	5,096,955	663,282		

Chilean railways use ties cut from roble pellin, Oregon pine, other varieties of wood, and steel. Roble pellin is divided into two classes, one known as roble Chileno and the other roble de la frontera. Roble de la frontera grows from the Province of Valparaiso to the Province of Valdivia and is found in compact stands, averaging between 60 and 70 trees to the hectare, as well as mixed with other species. It is one of the tallest of all Chilean trees, reaching at times a height of 160 feet, although average stands are usually about 125 feet. The diameter at base is usually between 30 and 60 inches. The wood varies with the age of the tree. When young it is given the name of "halle" and is of a light yellow color. It can easily be split or cut, and has little resistance against the climate. In adult trees the heart is a deep dark red, becoming lighter toward the bark. The wood is extremely hard and heavy, and retains moisture for many years. When it is not used in the dry hot climate of the north, it has great durability. The weight per board foot of the wood from adult trees is 2.7 kilos when green, 2.5 kilos half dry, and 1.8 kilos dry. Resistance tests have given the following results: Yield point, 535 kilos per centimeter; tensile strength, 407 kilos per centimeter.

The roble Chileno is a large tree and is abundant in the extreme southern section of the country. The wood is not durable and is much inferior in quality to that of the other roble.

Some Oregon pine has been imported for use but is generally considered too expensive.

In March, 1929, quotations on the west coast of the United States for Douglas fir crossties for domestic use, according to specifications of particular railways, ranged in price from \$15.50 to \$17 per thousand board feet at the mill. Roble pellin de la frontera, during the same period fluctuated between \$28 and \$30 per thousand feet in Santiago and Antofagasta.

The use of steel ties is more or less limited and in fact only two railways had any in use at the end of the year 1926.

Ties treated with preservatives are not generally used. The native woods are sufficiently hard to resist attacks from parasites.

¹ Data does not include steel ties.

The three varieties of climate possessed by Chile have a great deal to do with the type of ties used in the various sections. For example, wood which has poor resistance to weather could not be used in the southern section, where it rains abundantly for about nine months of the year.

During 1927 the sizes of ties ² in use by Chilean railways and the average number to the kilometer are shown in the following statement:

Size in meters	Average number to the kilometer	Size in meters	Average number to the kilometer
1.20 by 0.20 by 0.10	1,500	1.85 by 0.25 by 0.2	1,500
1.3 by 0.2 by 0.125	1,625	2.00 by 0.20 by 0.15	1,430
1.3 by 0.2 by 0.15	1,400	2.00 by 0.20 by 0.15	³ 1,430
1.40 by 0.15 by 0.10	1,400	2 by 0.15 by 0.20	1,650
1.69 by 0.15 by 0.1	1,000	2 by 0.203 by 0.124	1,430
1.80 by 0.2 by 0.12	1,720	2.13 by 0.25 by 0.13	1,430
1.8 by 0.2 by 0.125	1,400	2.44 by 0.15 by 0.25	1,432
1.8 by 0.2 by 0.15	1,500	2.7 by 0.15 by 0.25	1,300
1.8 by 0.2 by 0.15	³ 1,500	2.7 by 0.2 by 0.15	1,430
1.83 by 0.2 by 0.13	1,500	2.80 by 0.15 by 0.25	1,635
1.83 by 0.203 by 0.127	1,430	3.05 by 0.23 by 0.178	1,650
1.85 by 0.2 by 0.15	2,000		

In 1923, the Chilean State Railways commenced planting eucalyptus and pimento trees at intervals along the Longitudinal Railway for the purpose of providing tie reserves. It is believed that in 1935 these plantings will be sufficient to take care of the needs of the State railways. Little is known of the durability of pimento ties, as they have not yet been introduced into common usage. However, this wood embodies the necessary qualities for use in dry sections of the country, and also has the additional advantage of being resinous, which may make it adaptable for ties in the southern section of Chile. It is not thought that it has the longevity possessed by the roble pellin which has an average life of from 5 to 6 years in southern Chile, 8 years in the central section, and between 8 and 9 years in the northern section. Eucalyptus is only used in the northern section owing to its poor resistance to the weather. It is estimated that the average life of eucalyptus is from 4 to 5 years.

REPAIR-SHOP EQUIPMENT

Generally speaking, excellent facilities for repairing locomotives and rolling stock are available to all Chilean railways. The railways which are operated in connection with mining properties naturally rely on the shops maintained for the upkeep of mining equipment. The British-owned railways, other than industrial, depend for the most part on their own shops, which incidentally are equipped almost entirely with British tools.

The Chilean State Railways operate shops at several points on their system. The principal shops, located at San Bernardo were built in 1910, according to specifications submitted by the Niles-Bement-Pond Co. of New York City in collaboration with engineers from the General Electric Co. and the United States Steel Products Corporation. The shops cover about 300 acres of land, of which approximately 112 acres are used for general shops and 180 acres for

¹ Data pertaining to each railway are shown under individual railways.

² Steel ties.

the homes of workmen. In all they compare favorably with well-equipped railroad repair shops in the United States. The original machinery installed was furnished by the Niles-Bement-Pond Co. at a cost of approximately 5,000,000 pesos. (A detailed discussion of these shops appears under the heading "Repair shops" in the section devoted to the Chilean State Railways.)

Chilean import statistics do not set up any specific classification which would indicate the imports of machinery and tools used in connection with railway repair shops. They, of course, show the imports of various machine tools under separate classifications but these are used for many enterprises and there is no way of determining the value of those set up in railway shops. There is, however, a general classification under the heading "Imports of railway equipment," which is called "Other railway material and tools."

During the 10-year period 1918 to 1927, inclusive, the value of these imports amounted to approximately 28,600,000 pesos, or about 7 per cent of the total imports of railway equipment. This total undoubtedly includes items other than tools used in repair shops. Slightly over 50 per cent of this equipment, valued at approximately 15,000,000 pesos, was imported from the United States; 28 per cent, valued at 8,000,000 pesos, from Great Britain; and 16 per cent, valued at 4,500,000 pesos, from Belgium. Annual imports were largest during the year 1924 when approximately 6,000,000 pesos, or 21 per cent, entered, as compared with 5,000,000 pesos, or 18 per cent, in 1921, and 4,500,000 pesos, or 16 per cent, in 1914. Appendix B should be consulted for detailed data.

There is a strong trend toward power-driven machine tools and practically all replacements are being made on that basis. It is also worthy of note that in view of the constant changes in operating equipment the demand for machine tools should increase.

PURCHASING METHOD OF STATE RAILWAYS

Practically all purchases made by the Chilean State Railways are by means of public tender, although certain minor purchases and major purchases in emergencies are made direct. The purchasing office of the State Railways is located at Alameda Station, Santiago. A branch of this office is located at 225 Broadway, New York City, which, however, operates under the supervision of the head office. Before awards can be made they must be passed upon by the Ministerio de Fomento, Sección Ferrocarriles. Correspondence pertaining to purchases should be in Spanish and addressed to Sr. Jefe, Departamento de Materiales y Almacenes, Ferrocarriles del Estado, Santiago, Chile. The State Railways publish their requirements in bulletin form some three to six months before the date on which bids for foreign merchandise will be solicited. Specifications and plans are made available at that time to tenderers. These specifications are forwarded to the representative of the State Railways in Europe and also in the United States where they may be obtained upon application on the payment of a nominal fee. Before final awards can be made, the chief of the purchasing office must have them approved by the director general of railways.

The following general conditions for the purchase of material through public solicitations were issued by the Chilean State Railways in booklet form:

BIDS

1. The company assumes that all persons submitting bids accept the conditions and specifications contained herein, as well as the various special conditions and specifications which are referred to herein as applicable to certain cases.

NOTICES

2. The notices inviting public bids shall be published in three daily newspapers of Santiago, at least three times in each paper. The date for opening bids for material of national origin must be at least 15 days after the date of the first publication of the call for bids; if imported material is desired, a period of at least 90 days must be allowed from the date of the aforesaid publication.

SUBMITTING BIDS

3. Bids must be submitted in duplicate and on the special forms which the departamento de materiales y almacenes at Santiago will supply for that purpose. The bids must quote only the material, tools, machinery, etc., which the company will specify in each case.

DELIVERY OF THE BIDS

4. The bids must be delivered in a sealed envelope to the office of the chief of the departamento de materiales y almacenes (Alameda station) on the date and hour set in the respective specifications or publications. The bids must be accompanied by the proper guaranty deposit slip. If a sample of the article desired is required according to the special conditions, the bid must be accompanied by a receipt indicating that the said sample was delivered to the proper office of the aforesaid department.

No bid shall be received after the others have been opened and their reading begun.

PRICES IN LEGAL MONEY

5. Quotations must be given only in national legal money, unless the special conditions for each material expressly stipulate that quotations in other currency shall be considered.

PLACES OF DELIVERY

6. Material produced nationally must be delivered to the warehouses at Baron, Santiago, Concepcion, and Coquimbo, as specified in each case. Imported material must be delivered to the Baron warehouse, unless otherwise specified. Quotations must not include duties which shall be for the account of the company. The material must be delivered weighed or measured, as may be advisable, and properly classified and stored.

QUOTATIONS

7. If considered advisable, the company may deviate from the provisions of the previous paragraph and announce in the respective specifications that quotations shall be received c. i. f. Chilean ports and even f. o. b. foreign ports.

CONSULAR FEES

8. Consular fees on imported material must be paid by the contractors. The latter must consider this provision on fixing their prices.

MANUFACTURER'S DECLARATION

9. Every bidder must state in his bid whether the article offered is of domestic or foreign manufacture. In all cases, he must indicate the name of the factory from which the product originated.

PRICES PER UNIT

10. The bidder must quote prices per the unit indicated for each shipment or item and quote separately for each item. Several items may not be grouped even if they are similar. The company reserves the right to disregard bids not conforming with these requirements.

DELIVERY PERIODS

11. The bidder must clearly indicate the delivery period. If this period in any manner affects the price of the article, he may submit any alternate bids deemed advisable. The company reserves the right to disregard all bids not specifying definite periods of delivery.

VALIDITY OF PRICES

12. The prices quoted in the bids must hold good for at least one month, beginning with the date on which they were opened, unless bidders state otherwise in their offers. In all cases, excepting the prices for tin, copper, lead, zinc, and antimony, the prices must hold good for at least eight days. Therefore, unless otherwise stipulated in the bids, it is understood that prices are good for a period of 30 days. After that period the bidder may withdraw his offer in writing, stating his reasons therefore. If the offer is not withdrawn after the 30-day period and before the lapse of 37 days after the opening of the bids, the bid shall be considered as good for another 30 days and the bidder may not withdraw his offer until the end of the next 30 days.

If the bidder specifies in his offer that his prices are good for less than 30 days but for more than 8 days, the company reserves the right to disregard his bid if it believes that there is not sufficient justification for reducing the validity period of the bid.

LAW RELATIVE TO SEAL AND STAMP FEES

13. Both as regards the submitting of public bids and their acceptance there shall be observed the provisions of the decree law No. 350 relative to fees for seals, stamps, and sealed paper, dated April 25, 1925, as follows:

"Public bids submitted to the State offices, to the State Railway Co., to the juntas de beneficencias, or to municipalities, in addition to the proper sealed paper, 10 pesos; acceptance of bids, 5 centavos for each 100 pesos on the amount of the bid."

GUARANTY

14. All bids must be accompanied with a guaranty deposit receipt showing that a deposit was made with a bank or with the treasury of the company, for an amount equivalent to 10 per cent of the total value of the corresponding bid, if this amount is smaller than or equivalent to \$100,000, 5 per cent if the bid totals from \$100,000 to \$500,000, and 3 per cent if it totals more than \$500,000.

The successful bidder, before executing the document of acceptance, must raise the guaranty deposit up to 10 per cent of the total value of the accepted bid.

15. The guaranty deposits must be unreservedly made out to the order of the general director of the Ferrocarriles del Estado, without stating on the receipt the object for which the deposit was made. (Decree of the dirección general del departamento de contabilidad, No. 108, dated August 6, 1915.)

16. These guaranties must be deposited in money of the same kind as called for in the respective bid. (Agreement of the H. Consejo de administracion de los ferrocarriles del Estado, dated February 25, 1918.)

17. Deposit receipts issued by the following institutions shall be accepted as satisfactory guaranties:

Caja Nacional de Ahorros; Banco de Chile; Banco Nacional; Banco de A. Edwards y Cia.; Banco Español de Chile, at Santiago, Talca, and Concepcion; Banco Frances de Chile; Banco Anglo Sud-Americano; Banco Aleman Transatlantico; Banco Germanico de la America del Sur; National City Bank, New York; or Banco Italiano. Guarantees are also acceptable from the English and German banks established in Chile with offices at Santiago and in general from banks in this nation whose paid-in capital is over 5,000,000 pesos in national money. The reserve funds of these banks shall also be considered as part of the paid-in capital. (Agreement of the H. Consejo, dated October 25 and December 6, 1917; February 25, March 21, August 8, September 5, and May 5, 1920.)

18. Bonds of the caja de credito público will also be accepted for an equivalent amount. These bonds shall be estimated as having a value 10 per cent less than their quotation on the exchange.

19. If the value of the bonds decreases by more than 10 per cent during the period of the guaranty, the company may require that the deposit be increased by an amount sufficient to cover the loss; if necessary, the company may apply the sums due the contractor. (Agreement of the H. Consejo of the railway administration, dated August 22, 1918.)

20. Bonds subject to any encumbrance or court procedure may not in any case be offered as a guaranty. (Agreement of the H. Consejo de administracion of the ferrocarriles del estado, dated January 19, 1915.)

21. Checks shall not be accepted. No one is exempted from the obligation of submitting with his bid the proper deposit record as specified in article 15 of the general conditions, nor may he substitute other deposit slips or excess amounts of deposit slips in possession of the company, even if the latter are not applied to other obligations.

22. The company may, whenever it deems it advisable, authorize an exchange of the guaranties given for partly fulfilled contracts for other guaranties of a smaller amount which must, however, in all cases be equivalent to at least 10 per cent of the value of the material not delivered.

SAMPLES AND GRADES OF MATERIAL

23. Samples or a certificate of quality must be submitted for all materials or articles offered (art. 27) except for equipment, machinery, etc., in which case plans, specifications, catalogues, and all other matter required for their study must be furnished.

Samples may also be omitted if the bidder offers material strictly complying with the specifications of the company, unless otherwise provided for in the said specifications or conditions.

24. If the company invites bids for material to conform to certain specifications, the bidders must state in their bids whether these requirements have been satisfied. If the bidders have any doubts in the matter, they should submit samples and state in their bid what doubts they may have. If such a statement is not made, the company will understand that the material offered must be furnished strictly in accordance with the requirements stated in the respective conditions and specifications; therefore, if a bid is submitted, the bidder shall be held responsible.

25. All material contracted for according to plans must be delivered in conformity with the established dimensions, etc.

26. The samples, except those indicated in article 27, the plans, or catalogues mentioned in the bids must be delivered to the muestrario (sample room) of the departamento de materiales y almacenes, where they shall be received up to 6 p. m. on the working day preceding the date set for the opening of the bids.

27. The samples of all material to be tested, either by the chemical laboratory or in the taller de resistencia (test workshop), must be delivered to the muestrario of the departamento at least 10 days before the date for the opening of the bid. The interested parties must previously obtain the certificates of quality, after payment of the value indicated in the annexed tariffs.

After the proper notice, the company may increase the 10-day period to 30 days, for the various kinds of oils, paints, and varnishes. The certificate shall be valid while the samples are at the muestrario.

SIMILAR ARTICLES

28. Bidders may offer similar articles in their bids, under the express condition that they are of a better quality than those hitherto used by the company and that their use is more advantageous and economical, considering maintenance, repair, and operating expenses, all of which must be corroborated by the proper evidence.

ACCEPTING BIDS

29. The company may accept any of the bids submitted, even if it is not the lowest, or subdivide the order among several firms, or reject all bids.

30. In case of bulky material, the order for which could not be subdivided among several firms without affecting the prices, because of differences in freight charges or other reasons, the bidders may submit graduated bids in the most convenient form.

31. After an offer has been accepted by the company, and the respective contract delivered to the interested party, the latter shall have a period of six days, beginning with the date on which the oficina de partes has made the proper record of the contract of acceptance, to formulate in writing any objections he may desire to make with regard to the said contract. After that period, if the bidder has not submitted any objections, it shall be understood that the contract with all the conditions contained therein is accepted, and he shall therefore be bound to execute it. He is also understood as having accepted all liabilities indicated in the specifications for not complying with the contract.

32. Accepted bids shall be considered as real contracts from the time when the company notifies the contractor of its acceptance and the latter makes no valid objections.

FINES AND FORFEITURE OF GUARANTIES

33. Contractors must pay a fine of 1 per cent for each 15 days of delay in delivering the material contracted for. This fine shall be levied only on the total value of the material delivered after the proper time. This fine shall not be assessed if the said contractor submits good evidence that the delay was due to force majeure or to some other justifiable cause in the opinion of the dirección general de la empresa.

34. The fines shall be stamped on the invoices by the proper warehouse official and the amount deducted by the caja (cashier's office) of the company when payment is made.

35. If required by the needs of the service, and the contractor has not delivered all or part of the material contracted for, the company may purchase it direct for the account of the contractor, making the proper adjustment for the difference in price on the guaranty deposit record of the said contractor.

36. In case of harmful delays in deliveries, the dirección general may cancel the contract and the company may appropriate for its own use the guaranty deposit referred to in No. 14 of the general conditions.

INSPECTION OF MATERIAL

37. The company shall make final acceptance of the material only after testing in its own laboratories the samples derived therefrom and after the sección pruebas y adquisiciones (testing and purchase section) of the departamento de materiales y almacenes has satisfactorily certified to the quality of the material. An exception shall be made in the case of material for which the company has not the necessary equipment for testing purposes, such as axles, tires, boiler sheets, dynamos, etc. In the latter case, the company shall have the material inspected in the United States or Europe through its technical agents, without charge to the contractors.

If expressly requested by the contractors, a preliminary inspection of the quality and manufacture of the material may be performed in the United States or Europe. Such inspections must always be solely for the account of the contractor, including the cablegram costs involved.

Inspection costs in a foreign country shall generally be figured as 1 per cent of the total bid for the material, but it may, in special cases, for thorough inspections of the manufacture of the article, amount to as much as $1\frac{1}{2}$ per cent.

It is understood that such inspections, even if performed by foreign representatives of the company, are only of a provisional character and that final acceptance will be made in Chile when the material is delivered to the warehouses of the company.

MARKING THE MATERIAL

38. All the material and articles furnished this company must be marked with the initials "F. F. C. C. del E." in a conspicuous and indelible manner. If this can not be done, for instance if the material consists of waste, lubricants, oils, or other liquids, the said mark must be placed on the containers. An exception is made of material already available in this country offered for prompt delivery and which can not, therefore, be marked beforehand.

The company may require certain articles to be delivered with the factory mark, also the quality stamp, in conformity with the requirements of the respective purchasing contract.

DELIVERY AND RECEIVING OF MATERIALS

39. The material, articles, or machinery accepted by the company must be delivered to its warehouses, unless otherwise provided for in the call for bids.

40. The contractor is bound to deliver all material strictly in conformity with the specifications, samples, plans, etc., on which the contract was based.

41. Contractors obligated to deliver material, articles, etc., of a certain trade-mark must attest to the origin of them by a certificate of the respective factory.

42. The material contracted for by weight must be delivered and paid for according to the net weight. The company may retain the container, unless otherwise stated in the call for bids, for themselves.

43. To facilitate the receiving and classification of the material, the latter must be conveniently packed.

All contracts accepting a bid must clearly specify the kind of container required.

44. Material furnished in carload lots may be unloaded at the warehouses of the company by its crews for the account of the contractor, at the rate of \$2 per ton in national money. In such cases the warehouse official shall note on the invoice submitted by the contractor the unloading charges to be deducted by the cashier's office of the company when the invoice is paid.

45. During the life of the contract, the company may, if deemed necessary, require contractors to deliver, under the same conditions as to price, grade, etc., an additional 10 per cent of the material in excess of the quantity contracted for.

46. When receiving material of graduated or different dimensions, for which an average price was fixed, the company may require complete delivery before liquidating the account, so that there shall be no incomplete delivery of material of greater value.

DELIVERY PERIOD.

47. The bidders must specify the period or periods in which they bind themselves to deliver the material offered, the period to begin on the date when the company executes the contract of acceptance and to end on the day when the material is delivered to the proper warehouse.

In computing the aforesaid periods, the initial date shall be the date shown on the seal of the oficina de partes of the departamento de materiales y almacenes.

48. Prompt delivery shall be understood as delivery within 15 days following the acceptance of the bid, the time, etc., to be computed as indicated in the preceding number.

49. Bidders designating two or more delivery periods, must indicate the quantities to be delivered during each period.

FORCE MAJEURE CASES .

50. If a case of force majeure occurs during the execution of a contract, the contractor must notify the dirección general of state railways within 48 hours after its occurrence or after the said contractor had knowledge of it. If this notice is not furnished, the company will not, for the effects of the execution of the contract, consider the case of force majeure or accident. (Agreement of the H. Consejo de administración of October 26, 1916.)

Cases of force majeure or accidents must be evidenced by documents satisfactory to the company.

PAYMENTS

51. Payment for all material bought and delivered to the company warehouses shall be made within 30 days after the date when the chief of the stock of materials declares the material satisfactorily received, both as to quality and quantity; that is, when the said official has partly accepted the material within the stipulated period, as required in the acceptance contract, and the respective invoices have been properly checked, the said invoices having been properly forwarded by the contractors to the chief of the stock room in triplicate on the forms furnished by the company stamped with the date received below his signature.

INTEREST PAYMENTS

52. The company shall pay 6 per cent per annum interest on all commercial invoices not paid within 30 days after they were submitted as indicated in the preceding paragraph, provided the delayed payment is not the fault of the creditor.

PAYMENTS AGAINST DOCUMENTS

53. If deemed advisable by the company and previously stated in the special conditions governing the call for bids, the company may pay as much as 80 per cent of the cost of the material against delivery of the documents and the balance upon receipt of the material at the warehouse.

PAYMENT OF WAREHOUSE CHARGES

54. Contractors must pay the company storage charges for the space occupied by the material or articles not promptly removed from warehouses or other company property. It is understood that storage charges must be paid for material, etc., not delivered in compliance with the proper contract and which was

refused by the company, either because its quality is not as contracted for or because too large a quantity was delivered.

55. The application of storage charges shall be governed by the following rules:

The materials or articles rejected by the company on account of inferior quality or for other reasons and delivered in excess of the quantities contracted for must be removed by the said contractors within a period of six working days beginning with the date of the final rejection by the departamento de materiales.

56. If this material, etc., is not removed within the period indicated in the preceding paragraph, the contractors must pay a storage charge amounting to one-half per cent daily on the value of the material. No other value may be given to the said material except that established in the respective acceptance contract.

57. Materials or articles rejected may be kept in the warehouse for the time indicated in paragraph 55. After that period, the company may return the material to the owner or send it to the warehouse for material to be sold at auction. In either case, the contractor must pay the storage charges due, as well as other expenses involved.

58. The company shall reimburse itself for the storage and other expenses referred to in the preceding paragraph by deducting the proper amount from the respective guaranty deposit and, if necessary, also from the proceeds of the auction, if any held.

59. If material is sent to the warehouse where goods to be sold at auction are stored, the warehouse official must promptly notify the dirección general, departamento de materiales y almacenes, in writing and also the contractor in the same manner, requesting the latter to acknowledge receipt of this notice. (Decree of the dirección general, departamento de materiales y almacenes, No. 530, August 2, 1920.)

60. The "General conditions" pages 1 to 9 of the book "Condiciones Jenerales para la adquisición de materiales de los ferrocarriles del Estado," 2d, edition, 1921.

PLACE OF DELIVERY FOR LUMBER

61. Lumber must be delivered to the sheds provided therefor at the stations of the company.

SUBMITTING BIDS

62. Bids must be submitted in duplicate.

PROVISIONS RELATIVE TO DUTIES

Material offered to the company must be quoted delivered to the State Railway warehouse. Prices must not include duties which shall be for the account of the company. The contractor must pay lighterage, unloading, and freight charges until the material is stored in the warehouse.

The contractors must load the material for the company, consigning it to the Ferrocarriles del Estado (State Railway) in separate shipments and with documents in duplicate, provided that the total weight of the merchandise ordered from the same contractor by one contract is more than 2,000 kilos. Expenses incurred by the contractor (including duties) because of a violation of these provisions shall not be paid in any case.

However, in the case of material purchased from a bidder by a certain contract and weighing less than 2,000 kilos, the duties may be included with the price. In such cases, the contractor must compute the duties before a definite award is made, subject to verification by the departamento de materiales.

After the material is unloaded by the contractor or the navigation company, as the case may be, the latter must deliver to the officials of the zona (customs district) the shipping papers with the proper permit and a provisional invoice so the company can clear the shipment at the customhouse. The contractor or navigation company must also submit to the director of the zona (customs district) a deposit slip to the order of the latter for a sum equivalent to the amount of duties, plus 15 per cent to be computed and established by the proper company official.

The deposit slip referred to shall be returned to the contractor by the customs officials promptly after receipt of the material by the chief of the stock department. If the material is not brought to the warehouse or is rejected because it is not as specified in the contract, the company may use the deposit to reimburse itself for the duties and other charges, according to the tariff in effect, and also for any fines due and judicial action necessitated by the bad faith of the contractor.

The material contracted for with the understanding that it must be delivered to the warehouse by the contractor and cleared through the customhouse by the company, shall, as long as it is in the customhouse or on the wharf, continue to be for the account and under the responsibility of the contractors, until the shipment is delivered to the said warehouse.

Bidders must notify the departamento de materiales y almacenes in writing of the date on which the shipping documents will be delivered to the directors of the first district for the proper customhouse formalities.

To compare the prices quoted at the public bidding for imported material with national prices or commercial quotations current in this country, the amount of duties shall be added to the prices quoted in the bids.

PURCHASING METHOD OF PRIVATELY OWNED OR OPERATED RAILWAYS

As pointed out in the beginning of this section, purchases made by British-owned railways are all accomplished through England while those for American-owned railways in the United States. Generally speaking, the British railways buy British equipment and the American railways American equipment. In the chapters devoted to the individual railways is a paragraph denoting how each one of these railways purchases its supplies. The names of the officials who are in charge of these matters are given as well.

THE DEVELOPMENT OF CHILEAN RAILWAYS

With the development of the Chilean railway system from less than 100 kilometers in 1852 to more than 10,000 kilometers at the present time, Chile now possesses an excellent system of rail communications. Aided initially through the energetic ingenuity of William Wheelwright, a citizen of the United States, the country's railway development unfolds an interesting history. The railway from Caldera to Copiapo, which some claim is the oldest in South America, was first conceived by William Wheelwright when seeking a natural outlet for the silver and copper ores found in the Province of Atacama. Between the years 1845 and 1850 these commodities formed the chief export of the country. The mines, however, were about 90 miles from the seacoast and connected with it by a very poor highway. In addition the old port of Copiapo, the center of population for that region and which was situated at the mouth of the river of the same name, was far from satisfactory as a shipping point. Caldera had a far better harbor and sufficient water depth to permit vessels to load and unload direct from the pier. Surveys were made which definitely determined that the construction of a railway between these two points was entirely feasible. In the meantime, a man named John Mouat, of Valparaiso, had secured a concession from the Government to construct a railway from Copiapo to the old port of Copiapo. Wheelwright, having already determined to build the railway between Copiapo and Caldera, decided it was first necessary to induce the population of the port of Copiapo to move to Caldera. He sold his idea to the local populace and, by using a line of vessels in which he was interested, moved the entire settlement. When this occurred the Government refused permission to John Mouat to construct the railway for which he had already obtained a concession.

With the preliminary arrangements negotiated the Cia. del Camino Ferrocarril de Copiapo was organized by Wheelwright, with a capitalization of \$800,000. It purchased for \$300,000 the concession held by Mouat. Wheelwright immediately visited the United States and engaged the engineering firm of Allan & Alexander Campbell to construct the railway. In a short time they left for Chile taking a construction staff, locomotives, and rolling stock. The rails were purchased in England. Construction was commenced in 1851 and the line was finished the following year. The original locomotive "The Copiapo" is now preserved in the National Museum after having traveled approximately 118,643 kilometers. With the completion of this railway the city of Caldera became one of the leading shipping centers on the coast.

While this railway was the first one actually to be placed in operation, as early as June 4, 1847, the Government approved a project for the construction of a railway between Santiago and Valparaiso. This approval became an official law on June 10, 1849. By a decree issued July 19, 1849, a concession to construct this line was granted to

William Wheelwright. Under the terms of the concession it was valid for 30 years, and carried a guarantee of 5 per cent on a maximum capital investment of 18,000,000 pesos. In addition the usual exemption of duties on material and from all taxation was granted. In an effort to secure capital with which to construct this railway, Wheelwright visited London in 1847 and 1848; however, due to the economic unrest created by the French Revolution, he was unable to obtain the funds with which to carry out this project. In 1851 the Government decided to participate in raising capital for the work in order to more effectively control the railway at its completion. In 1852, 2,400,000 pesos was subscribed by Matias Cousino and 1,800,000 pesos each by Candelaria Goyenechea de Cousino and Jose Waddington, while the remainder was subscribed by the national treasury. Construction was commenced in 1852 and the railway opened to El Salto in 1855 and to Quillota in 1857. Funds having been exhausted with this construction, the Government in 1858 floated a loan in Europe of 21,000,000 pesos.

Henry Meiggs, an American, whose railway engineering work in Peru gained for him world-wide renown, signed a contract on September 14, 1861, to complete this railway from Quillota to Santiago. The railway was opened to traffic between Valparaiso and Santiago in 1863. This was the beginning of Chilean State Railway operation, although the Government at this time did not own entirely the railway just completed.

On September 10, 1855, the Sociedad del Ferrocarril del Sur was organized to construct a railway from Santiago to the River Maule, via Rancagua, Curico, and Talca. The company was capitalized at 9,000,000 pesos, which was increased to 14,256,000 pesos in 1856. Shares in the company were held by 138 shareholders in addition to the Government which, in accordance with the law of August 24, 1855, had subscribed 3,000,000 pesos. The first section of 16 kilometers extending to the town of San Bernardo was inaugurated by President Montt in 1858, and extended to the River Maipo, a distance of 28 kilometers, during the same year. With the inauguration of this section, there came into existence the beginning of the southern section of the State Railways system of the present, and now known as Red Central Sur.

The section to the River Cachapoal was constructed by Henry Meiggs. It was opened to Rancagua in 1859 and to San Fernando, a distance of 134 kilometers from Santiago, in 1862. According to a Government decree of October 19, 1864, the section from San Fernando to Curico was to be constructed by the Government and turned over to the Sociedad del Ferrocarril del Sur which would operate it on completion. A construction contract with a man named Garland was signed on January 19, 1865. The railway was completed and opened to traffic a distance of 185 kilometers from Santiago to Curico on December 25, 1868.

In accordance with a decree of December 21, 1867, a Mr. Slater was authorized to construct a line extending from Talcahuano (Concepcion), through San Rosendo to Chillan. This section was opened to traffic on June 10, 1879. The section Chillan to San Rosendo was to be part of the longitudinal trunk line system which was beginning to take form at this time.

On December 26, 1872, the Government authorized the construction of the line from Curico to Chillan and to extend the line south from

San Rosendo to Angol and to construct a short branch extending from Santa Fe to Los Angeles. A contract for the construction of these lines was awarded on May 5, 1873, to Slater, and all were opened to traffic by October 25, 1877.

On October 20, 1873, the Government acquired all the stock of the Sociedad del Ferrocarril del Sur and issued the first regulations for the administration of Government railways. In 1884 the main line extended from Valparaiso to Talcahuano and Angol, and the construction of branch lines from Renaico to Victoria and from Angol to Traiguén was commenced. In the same year the organic law for railway operation was enacted and the administration of the railways was placed in the hands of a director and council. Prior to this time the Government railways were divided into superintendencies absolutely independent of each other. At this time the Government owned and operated 950 kilometers of line while 1,254 kilometers were owned and operated by private enterprises. This organic law, however, marked the turning point in Chilean railway construction and from that time on a definite railway policy was carried out. It was based on the construction of a trunk line through the Central Valley with cross branches running from the coast to the foothills of the Andes.

The first actual construction work under this new program was that of the central line from the River Bio-Bio to the south. However, conditions were not satisfactory, and on January 26 and 29, 1914, Congress passed several new amendments which collectively were called the "Law of reorganization of the Government railways." This law established certain administrative reforms which required, among other things, adequate preparation in individuals appointed to the higher offices and recognized the necessity of supplying the railways with necessary funds for improving and supplementing their rolling stock.

Naturally the Government railway construction program was handicapped by the necessity of building railways in competition with private industry. In view of this fact, lines were not always constructed with the idea of profitable returns. With the crisis in mining operations, the Government was forced to take over the Chanaral Railway in 1888, the railway from Coquimbo to La Serena and Ovalle in 1895, the railway from Ovalle to Tongoi in 1901 known as the Ferrocarriles de Coquimbo, and the line from Caldera to Copiapo, or the Copiapo Railway, in 1911.

The Chanaral Railway was concessioned in 1865 to Don Jose K. Stevenson, who transferred his concession to a company in 1870. Construction was commenced in 1872 and the line opened to traffic from Chanaral to Salado, a distance of 35 kilometers. The railway deteriorated to such an extent that in 1887 the company decided to sell it to Sir Henry Bunster, who wished to transfer the permanent way and rolling stock to Colliquili. This met with opposition from the local populace and as a result the Government purchased the railway for 350,504 pesos in compliance with a law of January 20, 1888.

The Ferrocarriles de Coquimbo, which comprised the Coquimbo, Serena & Rivadavia Railway, the Serena, Coquimbo and Ovalle Line and branches, and the Ovalle & San Marcos Railway, were purchased by the state in 1895. The initial construction of the Coquimbo, Serena & Rivadavia Railway occurred during the period 1883 to 1885 when the line was opened to traffic from Serena to

Rivadavia. This line was completely destroyed by floods in 1888, but it was not until it was taken over by the state at a cost of 799,800 pesos that it was reconstructed and again opened to traffic. The construction of the Serena, Coquimbo & Ovalle line and branches was first authorized in 1855. The line was built to Las Cardas in 1862, to Higuieritas in 1866, and to the junction of the Rivers Granda and Hurtado in 1873. A portion of this line was destroyed in 1876 and it was rebuilt to La Puntilla, a distance of 93 kilometers. The state purchased it in 1895 for 3,266,666 pesos. The construction of the Ovalle & San Marcos Railway, which was first commenced in 1889, was completed in 1896 between Ovalle and Paloma.

Authorization for the construction of the Tongoy Railway, for the purpose of carrying ore from the Tamaya mines to the Port of Tongoi, was granted to a company in 1865. With the closing of the mines, the railway lost its principal traffic. The company then decided to extend it from kilometer 40 to Ovalle, abandoning 17 kilometers. Some construction work was undertaken but owing to heavy floods the work was stopped. In 1901 it was purchased by the Government for 385,000 pesos. This price also included the rolling stock. Under Government control, the line was finished to Ovalle and now forms part of the Central Railway system.

The railway from Caldera to Copiapo which was discussed at the beginning of this section had been extended so that when it was taken over by the Government in April, 1911, it had 281 kilometers of track in operation. Interruption of traffic by floods between 1905 and 1907 created a public demand for this action. It might be pointed out that the company originally intended to extend the railway through the Andes to Argentina but concessions which were granted for that purpose were allowed to lapse. This incidentally was the first proposed transandean railway. Surveys were made in 1868 and again in 1872, while in 1874 the Government granted the above-mentioned concession for its construction.

In 1913, the group of railways just mentioned, together with the Ferrocarril de Los Vilos and the Ferrocarril de Huasco, were united under one head into what later became the northern section of the Central Railway System. The construction of the Ferrocarril de Los Vilos took place during the 20-year period 1889 to 1909. It extends from the port of Los Vilos to Illapel, a distance of 77 kilometers. Work on a branch line from Choapa to Salamanca was commenced in 1909. Construction of the Ferrocarril de Huasco occurred between the years 1889 and 1894. The line runs from the Port of Huasco to Vallenar, a distance of 49 kilometers. This system of railways, which includes the lines between La Calera and Pueblo Hundido, forms the northern section of the State Railways system (Red Central Norte) and since 1917 have been placed under the same administration as that of the southern section in accordance with Law No. 2846 of January 26, 1914.

As of December 31, 1917, the northern section had 1,726 kilometers of main line track and branches in operation while the southern section had a total of 2,748 kilometers.

In the meantime private initiative had contributed to the general progress of the country's railways. A decree of June 17, 1856, authorized the construction of the Carrizal Railway which connects the port of Carrizal Barjo with Yerba Buena as a tramway. Later

decrees issued in October, 1863, October, 1865, and October, 1880, converted it to steam line traction and extended its original length. The line was first opened in 1864. Construction on the Taltal Railway commenced in 1881 under the auspices of Henry Meiggs. It was completed and opened to traffic to Refresco, a distance of 81 kilometers, in October, 1882. Miscellaneous branches and short lines were also built in the interim. Likewise railways were acquired by Chile in its conquest of Peru in 1879, the principal one of which was the railway from Arica to Tacna.

While a transandine railway was first considered in 1868, it was not until 1888 when a concession was granted to the Chilean-Transandine Railway Co. that actual work on a project of this sort was commenced. This railway was opened to traffic on May 16, 1910, and has since been in operation. Other transandean projects have been discussed from time to time but with the exception of the Antofagasta to Salta route, the construction of these railways is not being seriously considered. Further details pertaining to these projects will be found under the section devoted to the transandine railways.

During the period 1917 to 1927 the Government steadily increased its mileage both through construction and purchase in an effort to develop the natural resources of the country. Two of the largest railways taken over and incorporated into the Ferrocarril del Sur were the Concepcion-Penco, which was acquired in 1925, and the Lebu a Los Sauces, secured in 1928. The construction of the Lebu a Los Sauces Railway (Ferrocarril de Cia. Carbonifera Industrial de Lebu) dates to 1910 when the Chilean Eastern Central Railway Co. (Ltd.) was organized in London. The company acquired a concession from the Chilean Government to construct a line about 142 kilometers in length extending from the port of Lebu to the town of Los Sauces. At this point it was to connect with the Chilean State Railways. The concession was perpetual, but the Government reserved the right, subject to two years' previous notice, to purchase the line on valuation fixed by experts. Under this concession, 92 kilometers of track were constructed; 31 from the Port of Lebu and 61 on the Los Sauces end to Puren. At the time it was taken over by the Government it was owned by the Cia. Carbonifera de Lebu Consolidada (Lebu Consolidated Coal Co.). During the last three years of its operation it showed deficits of from approximately 300,000 pesos in 1923 to 750,000 pesos in 1925, while its freight traffic declined more than half in 1925 as compared with the preceding year, although the passenger traffic increased about 40 per cent. In April, 1929, tenders for the construction of the section of this railway between Peleco and Puren were requested. This section will be 47 kilometers in length and will have four tunnels along its right of way.

The Concepcion-Penco Railway (Ferrocarril a Lirquen) dates from August 19, 1885, when the construction of a line to connect Concepcion with the ports of Penco and Lirquen on the Bay of Talcahuano was authorized. The line was known as the Lirquen Railway and opened to traffic in 1890 as far as Penco, a distance of 17 kilometers from Concepcion. The line was never extended to Lirquen, although the State Railways run through Lirquen and connect with the line at Penco. This railway showed a gradual increase in operating profit

from 250,000 pesos in 1920 to 400,000 pesos in 1924. This was the last year for which operating results were shown in the Government reports. However, it was not until decree No. 3122 of June 10, 1929, that this railway was authorized to be purchased by the Government from its owners, the Campaña Minera e Industrial de Chile, at a cost of 1,000,000 pesos in cash. This railway was incorporated into the Ferrocarril del Sur.

In 1909 work was inaugurated on the Longitudinal Norte, which when completed will extend from Pueblo Hundido to Arica. The section from Pueblo Hundido to Pintados has already been placed in operation while the section from Pintados to Iquique was inaugurated in January, 1929. Although this railway is Government owned the section from Pueblo Hundido Pintados is operated under the name of the Chilean Northern Railway Co. (Ltd.) by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.). The section recently inaugurated between Pintados and Iquique is under the direct management of the Ministerio de Fomento, Sección Ferrocarriles, and has no relation to the Central Railway system.

In addition the Linards to Colbun railway, which had been operated by the Government since its construction in 1915, was turned over to the State Railways and incorporated into the southern section in 1923.

It is also interesting to note that under the proposed 6-year plan for construction of railways, approximately 183,000,000 pesos are to be spent, as provided for under the provisions of the 1928 extraordinary budget and plans for public works. This program involves the following railway construction:

[Values in millions of pesos]

Projects	Kilometers of railway	1928	1929	1930	1931	1932	1933	Total
Various studies.....		0.35	0.35	0.40	0.40	0.40	0.40	2.30
Iquique to Pintados and branches.....	169	12.10	8.00					20.10
Mariposas to Lircay.....	23	1.25	1.25	.50				3.00
Cocule to Lake Ranco.....	66	1.80	2.50	3.10	4.60			12.00
Loncoche to Villarica.....	42	1.50	3.00	3.00	2.00	2.00		11.50
Quino to Galvarina.....	30	1.50	2.00	2.00	3.00			8.50
Rio Negro to Maullin.....	90		3.00	5.00	5.00	5.60	4.60	24.10
Lebu and Los Alamos Railway.....	49	2.00	5.00	6.00	6.00	4.00		23.00
To port of Constitucion.....	120	1.50	3.00	4.00	4.00	4.00	5.00	21.50
Transandean through Salta.....	170			4.00	6.00	9.00	10.00	29.00
Transandean through Lonquimay.....	155				4.00	8.00	16.00	28.00
Total.....	914	22.00	29.00	28.00	35.00	33.00	36.00	183.00

¹ This evidently should be 3.90. The summation of items for 1929 appears to be 28.10 instead of 29 as given.

At the present time there are approximately 10,662 kilometers of main line track and sidings in operation in Chile. Of this amount, the Government owns 6,958 kilometers and 3,704 kilometers are owned by private interests. Of the Government-owned kilometerage the State Railway system comprises 5,541 kilometers of which amount 1,877 kilometers are in operation by the northern section and 3,664 kilometers by the southern section. Of the remainder, 460 kilometers, comprising the Arica-La Paz Railway, are operated under the direct management of the Ministerio de Fomento, Sección de Ferrocarriles, 66 kilometers, comprising the Puente Alto-Volcan Railway, are under the direct administration of the War Department,

and 889 kilometers which comprises the Longitudinal Norte are administered by two methods, 742 kilometers being operated under the name of the Chilean Northern Railway Co. (Ltd.) by the Antofagasta (Chile) & Bolivia Railway Co., while the remaining 147 kilometers are operated by the Ministerio de Fomento, Sección Ferrocarriles. In addition to the above railway mileage, there are approximately 387 kilometers of street railway line in operation. Five of

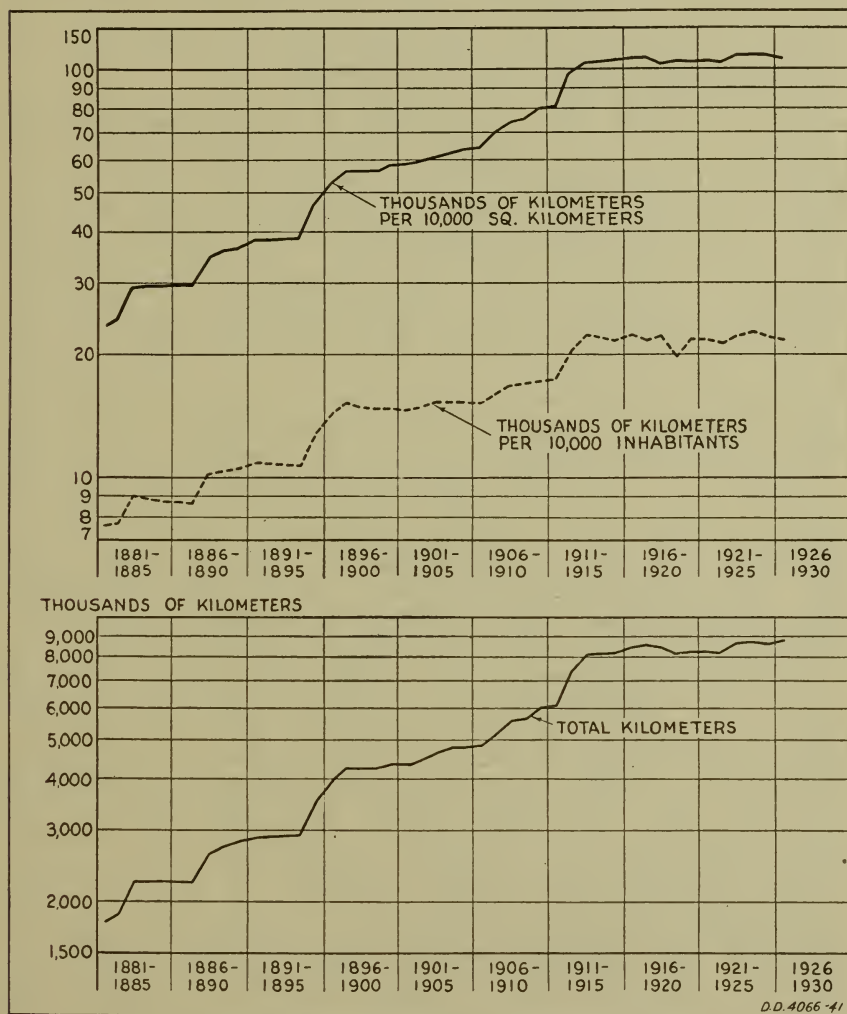


FIGURE 2.—Development of steam railways in Chile as compared with population and area

these lines approximating 35 kilometers, are operated by mule traction, while the remainder are all operated by electricity.

The accompanying chart indicates the railway development as compared with population and area. It will be seen from the chart that the greatest era in railway construction occurred during the 5-year period 1911 to 1915 when approximately 2,500 kilometers of track were constructed.

LEGISLATION

The basis of all Chilean railway legislation, for both independent and state-owned railways, was the law of August 6, 1862, known as the "Ley de Policía de los Ferrocarriles."

This law was divided into three sections. The first indicated the legal provisions to be observed by railways in the maintenance of their right of way, buildings, etc., the safety measures to be used, and general conditions relative to construction work; the second section contained general rules and instructions relative to operation; while the third section related to traffic regulations.

In the interim between the enactment of this law and the general railway law of 1925, the original intent of the law was more or less nullified through the promulgation of various decrees which seriously engendered the working of the law. Special interests were well protected, new methods for issuance of concessions conceived, and as might be expected with increasing mileage new problems requiring governmental regulations were developed. As a result it was almost impossible to determine correct railway procedure. Private interests which constructed new lines were supported by Government financial guaranties which ranged as high as 7 per cent on the capital invested. In many cases these interests were only interested in railway operation after completion, if the lines were financially successful. Consequently the Government was forced to take over many of these lines and repay the original investors practically the entire investment with interest.

Because of all of these difficulties, the Government realized that it was necessary to have a uniform railway law, and after much effort and research on the part of Chilean Government officials there was enacted by decree, law No. 342 of March 13, 1925, a general railway law. This was supplemented by decree, law No. 684 of October 17, 1925, which modified certain conditions in the original law and supplied certain additions which had previously been omitted.

It is interesting to note the close analogy which this law has to the United States transportation act of 1920, as it was only in that year that the Interstate Commerce Commission really became an arbitrator in disputes between railways, groups of shippers, and shippers and carriers. It might be pointed out that where our transportation act applies only to interstate carriers and shipments the Chilean general railway law provides means of regulating even the smallest of the industrial lines in operation in that country except when it conflicts with the terms of their concessions. It is true, of course, that owing to the unity of government in Chile and the lack of state legislation that conditions similar to those existing in this country are not found. The Chilean law regulates the procedure for securing concessions; stipulates the safety measures which the Government shall demand of concessionnaires; prescribes the form in which disputes arising between railway companies and the public or authorities shall be settled; furnishes the concessionnaires with funds for expropriating land for the construction of the railway and branch lines; issues the necessary franchises for railway construction and operation; provides means for harmonizing the services of the various railway companies; and the insuring of accord between carriers when joint service is necessary. This law also extends to inland water carriers.

The profitable operation of the carriers is guaranteed by the governmental regulation of the tariffs. When the profits exceed 9 per cent of the capital invested, 10 per cent of this sum is placed in the railway fund. Similarly, if the ratio between the expenditures and receipts of operation is less than 70 per cent, tariff reductions are applied. The Chilean law guarantees each carrier such rates as are needed in accordance with its own conditions, which is contrary to our own legislation, which places certain carriers of distinct economic and commercial conditions into one uniform traffic zone.

In addition the general railway law outlines provisions for policing railways, and provides penalties that shall be incurred for crimes and offenses committed by the companies or third parties in order to insure efficient service and public safety.

As a result of this law railway control and policy is effected in accordance with the following representations: Secretary of Communications, Council of Ways and Communications, Superior Railway Inspection Board, and private and state railway companies.

From this set-up it can be seen that the connection on railway questions between the Government and the National Congress is effected by the Secretary of Public Works (Ministro de Fomento), who is a member of the President's cabinet and also president of the railway council.

The railway law also created the railway council (*consejo de los ferrocarriles*), superior railway inspection board (*Inspección superior de ferrocarriles*), and the general railway fund (*caja de ferrocarriles*) for the purpose of administering Chilean railways.

The railway council is charged directly with the policies of public transportation services. It was created to foster and organize a general plan of development of transportation arteries, and to investigate the measures necessary for the fulfillment of this plan as well as to supervise its practical execution. It fixes tariffs, referees relationship disputes that occur between the public and the companies or between companies, administers the general railway fund, oversees construction work, as well as other similar functions.

It is presided over by the Secretary of Public Works and is composed of a chief inspector and subinspector of the railways, two engineers representing the directorate of public works, and engineer from the ports and works service, a representative of the army staff, two employees of the administrative council of the State railways, two representatives of the independent railways, one representative of the Nitrate Producers Association, one member of the *Sociedad Fomento Fabril* (an association of the national manufacturing industries), a representative of the National Mining Association, and a representative of some workman's association legally established for more than 20 years.

The technical bureau through which this council operates is the superior railway inspection board. The chief of this board presides over the railway council in the absence of the Secretary of Public Works. This bureau is charged with inspecting and overseeing the construction of railways intrusted to private enterprises as well as the operation of all railways in the country including the State lines. It has a personnel of engineers, accountants, draftsmen, etc., with salaries fixed by law.

The general railway fund administered by the railway council is made up of contributions from private and State railway companies.

When the proceeds exceed 9 per cent of the capital investment, 10 per cent of this sum is placed in the railway fund. It is used to pay the expenses arising from the enforcement of the general railway law; the instruction of technical railway personnel; and also to encourage construction of new lines and the betterment of existing ones.

RETIREMENT AND BETTERMENT FUND

At the present time all State Railway employees participate in the compulsory retirement and benefit fund maintained by the Government. The State Railway Retirement & Benefit Bank was created to administer the funds which are collected in the following manner: 5 per cent is deducted from the wages and salaries of all employees; 50 per cent is deducted from the first month's increased pay of all employees promoted to a position with a greater remuneration; 50 per cent is deducted from the first month's pay of all new employees entering the service. The State Railways shall contribute, in the form of a subsidy, a sum each year equivalent to 5 per cent of the total compensation paid to employees during the year. The State Railways shall contribute, as a subsidy, a sum each year equivalent to 1½ per mil of the gross traffic receipts according to the statements of the various companies. The interest earned by the preceding items shall also be added to the fund.

The full amount of all funds credited to his account plus 5 per cent interest will be paid to employees retiring voluntarily after 20 or more years of service. If the employee retires after 5 or more years of service but less than 20 years, he will receive the retirement due him plus 5 per cent for each year of service. If he retires after less than 5 years of service, he receives only the retirement fund due him; however, if he has served for more than one year he receives interest on his deposits at a rate 2 per cent higher than that in effect on time deposits paid by the bank. After 35 years of service employees are voluntarily retired at 75 per cent of their last salary. Retired employees must contribute 5 per cent of their pensions to a fund for pensioning dependents. If the employee leaves the service owing to illness which incapacitates him for performance of duty, he is entitled to the full amount of his retirement fund, irrespective of his years of service. If he was discharged by the company he is entitled to receive only the amount deducted from his wages. In the case of death, his entire fund is paid to his heirs.

TARIFFS

The Chilean railways offer two classes of passenger services. The Government-owned railways indicate their services by first and third class, while the privately owned lines call their services first and second class.

Freight rates on the independent railways are not fixed on any uniform base and generally returns are what the traffic will bear. In many instances these lines are operated in connection with mining properties by private industrial concerns so that it is sometimes difficult to determine accurately the actual transportation costs of freight movement. Such rates as are fixed by these independent railways are in instances where they are carrying other than company freight.

The State Railways, however, have well prepared tariffs computed for the most part on the weight basis. Some few commodities are transported on the basis of cubic measurement. The southern section

of the State Railways System has much lower rates than the northern section.

NATIONAL TOURIST BUREAU

The Government has recently organized a national tourist bureau for the purpose of disseminating information pertaining to Chilean travel. Under the terms of this bill which became effective on March 1, 1929, specific taxes are levied on railway fares, hotel bills, etc.

The articles pertaining to its functions and financing are as follows:

ARTICLE 1. There shall be established, in the Ministry of Public Works, a bureau which shall be charged with the stimulation of national tourist travel.

ART. 2. The functions of this bureau shall be:

(a) To advertise, at home and abroad, the tourist centers and the natural beauties of the country.

(b) To supervise the exhibition and distribution of posters, pamphlets, films, and other publications designed especially to disseminate information concerning the tourist regions and centers. Newspapers, magazines, and similar publications are exempt from this intervention.

(c) To stimulate the construction or installation of hotels, bathing resorts, minerals baths, or other establishments for lodging or providing residence to travelers or tourists, and to intervene in the examination and approval of the plans for the construction or installation of such establishments.

(d) To supervise the exact and uniform application of the tariffs which the proprietors or managers of hotels or guest houses must fix each year for their establishments, and which may not be increased during such period, except at special times or under exceptional circumstances and then only with the expressed authorization of the tourist bureau, which increase shall not exceed 25 per cent.

(e) To supervise the operation of every enterprise which is engaged in organizing or conducting tours.

(f) To authorize and supervise tours organized by business enterprises, and exact the necessary guarantees for the fulfillment of their programs.

(g) To assist in the conservation of the natural beauties, sites, relics, and monuments of the nation, and, in accordance with the regulations in force, recommend to the Government or municipality the necessary measures of conservation.

(h) To recommend adequate measures to facilitate communication with tourist sites, and to study and recommend the means whereby tourists may make trips within the country in the most comfortable and pleasant manner possible.

(i) To assist in the enforcement of this law and the regulations that may be issued for its application.

ART. 4. In order to meet the expenditures called for by the application of this law, the following taxes are established:

(a) A 1 per cent tax on first and second class railroad tickets, which shall be collected on the State railroads, as well as on private railroads. In no case shall this tax exceed 1 peso for first-class tickets, or 50 centavos for second-class tickets.

(b) A 1 per cent tax on first and second class steamship passages. In no case shall this tax exceed 3 pesos on first-class tickets or 1 peso 50 centavos on second-class tickets.

(c) A 2 per cent tax on first class steamship or railroad tickets with destinations outside of the country, and a 1 per cent tax on second-class tickets.

(d) Twenty pesos as a tax for entering the country (head tax) upon passengers of foreign nationality who have first-class steamship or railroad tickets, and 10 pesos for those who have second-class tickets. Minors of 16 years and under are exempt from this tax. Nationals of adjacent countries shall pay one-half of the tax which applies to them in accordance with this provision.

(e) Fifty centavos on hotel bills of which the value does not exceed 100 pesos, and 1 peso on such bills when they are for 100 pesos or more.

For the purpose of the taxes to which this article refers, single class and the so-called intermediate classes of steamship companies shall be considered as second class.

Servants or domestic employees traveling by water shall pay one-half of the tax which applies to them.

A passenger in transit shall not be subject to the taxes established by this article. The conditions which a passenger in transit must fulfill in order to be considered as such, shall be established in the regulations which the President of the Republic issues for the operation of this law.

CENTRAL RAILWAY SYSTEM

REGULATION

Previous to the law of 1884, when various sections of what is now known as the central railway system¹ were coordinated through a central administrative council, operation was under an administrator who controlled the lines in his particular district. This law, however, created four departments or operating zones,² the heads of which formed the administrative council, and controlled the operation of



FIGURE 3.—Bridge over Bio-Bio River, central system, Chilean State Railways

the system until a new law was enacted in 1907. This law likewise was found deficient through the lack of the centralized control delegated to it and as a result legislation enacted in 1914 granted the State Railways full autonomy. Under the law of 1914 the technical and financial administration of the railways was delivered to an administrative council selected from industries and various branches of the Government. This council was to have full and complete control of all activities. The arrangement, however, was not satisfactory and under the railway law, enacted in 1925, the operating status of the State Railways was again changed.³ Since March, 1927, the Government has abolished the functions of the railway council,

¹ For law pertaining to maintenance and operation see section on legislation.

² Description of these zones found on p. 67.

³ See section on legislation.

the main advisory council created under the railway law of 1925, in so far as the State Railways were concerned, and appointed a director general to assume its powers. It is understood this is only a temporary expedient and is to be changed shortly.

OPERATING OFFICIALS

The operating officials of the Chilean State Railways as of June 1, 1929, were as follows. Included in this list are the names and addresses of their representatives in Europe and the United States.

Director general, Pedro Blanquier, Estación Mapocho, Santiago.

Jefe del departamento de transporte, Francisco Cereceda, Estación Mapocho, Santiago.

Jefe del departamento de la via, Juan Lagarrigue, Estación Mapocho, Santiago.

Jefe del departamento de tracción y maestranzas, Enrique Marfil, Estación Alameda, Santiago.

Jefe del departamento de materiales y almacenes, Carlos Schneider, Estación Alameda, Santiago.

Jefe del departamento de finanzas y contabilidad, Alberto Diaz, Estación Mapocho, Santiago.

Jefe del departamento del personal, Jose A. Carvajal, Estación Mapocho, Santiago.

Jefe del servicio de señalización, W. J. Evans, Estación Yungay, Santiago.

Jefe de las maestranzas de San Bernardo, Enrique Palma, Estación San Bernardo, San Bernardo.

Abogado jefe, Ramon Luis Henriquez, Calle Teatinos 254, Santiago.

Representative in Europe, Alejandro Betrand, 88 Boulevard Saint Michel, Paris.

Representative in United States, Genaro Benavides, 225 Broadway, New York City.

PURCHASES

All major purchases for the state railway system are made by public tender. Minor and emergency purchases are generally made direct from local stores. See section on the "Railway Equipment Market" for details.

FINANCES

According to the financial statement of the central system, its lines were profitably operated from 1922 through 1927, owing entirely to the results in the southern section. The northern section has not shown a profit since its incorporation into the system in 1917. For the year ended December 31, 1927, the central system had an operating profit of 31,000,000 pesos. This represented a decline of approximately 10,000,000 pesos from the previous calendar year, which was the most profitable year recorded, approximating 44,800,000 pesos. However, the 1927 profit was still larger than in any of the preceding years. This profit was obtained from a net income of 36,000,000 pesos shown by the southern section from which was deducted an operating loss of 4,500,000 pesos incurred by the northern section. During the 14-year period 1914 to 1927 the southern section has reported an operating profit during nine years. The largest deficit incurred by this section was for the year 1914 when a loss of 17,500,000 pesos was reported.

COMPARATIVE OPERATING DATA FOR CENTRAL SYSTEM, CALENDAR YEARS
1914 TO 1927

[In thousands of pesos]

Calendar years	Operating revenue		Operating expenses		Operating profit or loss	
	Southern section	Northern section	Southern section	Northern section	Southern section	Northern section
1914 ¹	60,235	-----	77,815	-----	-17,580	-----
1915 ¹	73,720	-----	71,038	-----	+2,682	-----
1916 ¹	74,125	-----	73,216	-----	+909	-----
1917	74,527	7,421	72,105	10,862	+2,422	-3,441
1918	81,473	6,805	88,560	13,284	-7,087	-6,479
1919	91,981	6,922	102,598	16,111	-10,617	-9,189
1920	100,365	6,863	116,088	15,997	-15,723	-9,134
1921	147,654	9,014	152,866	19,567	-5,212	-10,553
1922	158,127	9,798	126,278	17,795	+31,849	-7,997
1923	169,954	10,225	133,256	15,559	+36,698	-5,334
1924	186,669	10,727	150,115	16,186	+36,554	-5,459
1925	210,675	12,784	173,613	18,432	+37,062	-5,648
1926	223,696	15,473	178,894	18,784	+44,802	-3,311
1927	220,717	15,477	184,307	20,062	+36,410	-4,586

Calendar years	Total profit or loss combined central section	Operating ratio		Total cost of operation and financing, ² southern section	Profit or loss, ¹ southern section	Average exchange in pence per peso
		Southern section	Northern section			
		<i>Per cent</i>	<i>Per cent</i>			
1914 ¹	-----	129	-----	77,982	-17,747	8.96
1915 ¹	-----	96.3	-----	71,223	+2,497	8.25
1916 ¹	-----	98.7	-----	73,336	+789	9.47
1917	-1,019	96.7	146	72,208	+2,319	12.73
1918	-13,566	108	195	89,102	-7,629	14.59
1919	-19,806	111	233	105,293	-13,312	10.58
1920	-24,857	115	237	121,486	-21,121	12.07
1921	-15,765	103	217	176,215	-28,561	7.32
1922	+23,852	80	183	148,194	+9,933	6.5
1923	+31,364	78.5	152	152,320	+17,634	6.44
1924	+31,095	80.4	150	175,857	+10,812	5.79
1925	+31,414	82.4	144	197,001	+13,674	5.8
1926	+41,491	79.9	121	201,598	+22,098	6.15
1927	+31,824	83.5	129	206,296	+14,421	6.00

¹ Northern system not incorporated in central system of State Railways until 1917. Previously kilometrage was series of sections operating directly under Minister of Public Works similar to present status of Arica-La Paz Railway.

² Data for northern system not available.

Many reasons have been advanced for the uneconomic operation of the State Railways during the period of their development, but it can be safely assumed that there were three primary causes.

Probably the outstanding cause can be attributed to tariff difficulties. As will be remembered, the law of 1914 established the State Railways as an autonomous body when the lines which now form the central section were turned over to it by the Government after the final liquidation of their accounts. This law, however, contained a clause which allowed the Government to subsidize certain articles or areas through protective rates. As a result of these protective tariffs the operating income was not sufficient to permit the administration of the system in a satisfactory manner. Even to-day it is the policy of the Government to maintain low rates on the northern section of this system although the income is not sufficient to cover operating expenses. This form of subsidization has been greatly criticized by individuals who point out that the low rates maintained by the

northern section benefit only a small number of citizens, whereas the subsidation of the railways by the Government is paid out of the pockets of all the citizens of Chile.

Others point out that this policy is a prime requisite toward colonization and development of the northern section of the country. They indicate that whereas the southern section has the industrial centers from which to draw traffic, the northern section is forced to rely for the most part on products from mines which, in certain instances constitute direct competition with the industrial lines operated by the mining companies. Competition from coastwise shipping likewise greatly decreases traffic receipts, while the fact that most of the freight moved is all in one direction tends to increase operating costs.

Another primary cause was the question of exchange. Fluctuation of peso exchange from 46d. in 1870, 31.75d. in 1884, 12.5d. in 1894, 17d. in 1900, 8d. in 1915, to 6.5d in 1922, naturally reacted adversely



FIGURE 4 --Section of railway between Malvilla and Llo-Lleo, central system, Chilean State Railways

on the Government railway finances. With the rates payable in current money their income decreased while salaries, wages, and value of materials increased. In 1914, the State Railway tariffs were placed on a gold basis, and until recently when the entire currency was placed on a gold standard, changes in tariffs were frequent and were made by adding surcharges to the established rate based upon the exchange value of the peso.

The third primary cause was owing to the deteriorated condition of the equipment and the expense connected with financing its replacement and modernization. Practically no consideration was given to improvements and betterments during the development period. The handling of the increased traffic was attempted without additional equipment. As a result, at the end of the World War, the rolling stock was insufficient to handle the traffic originating on the lines and much of it was in bad physical shape. It was necessary to

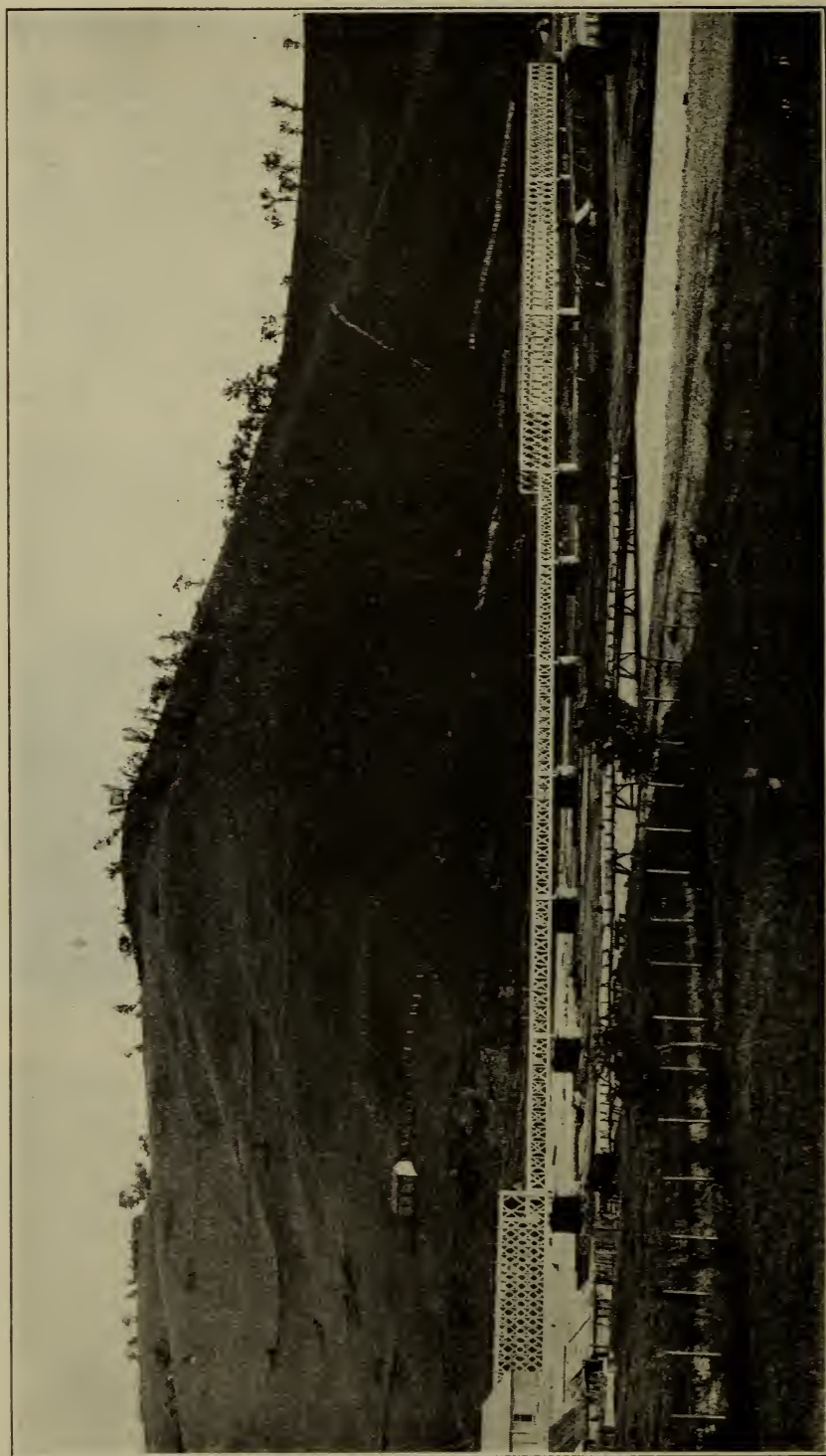


FIGURE 5.—Cantin Bridge, central system, Chilean State Railways

reconstruct a great deal of this equipment, as well as to improve certain sections of the right of way and to modernize the workshops before the system could even be placed on a basis for economic operation. Because of the high price of coal and the heavy traffic between Valparaiso and Santiago it was determined that the line between these points should be electrified. These improvements naturally called for considerable expenditure. As the system was in no position to finance this program itself, it became necessary to go into the foreign loan markets. In view of the unstable condition of the exchange and the unknown producing power of the railways, the Government was forced to pay 8 per cent interest on foreign loans.

At this rate of interest two of these loans were contracted in the United States, amounting to \$34,500,000. The first of these loans, which was for \$24,000,000, was floated by the Guaranty Trust Co. in 1921. Of the total amount of the loan, the State Railways received \$17,405,143 while the remainder went to the Government for other purposes. The second of these loans was for \$10,500,000, floated by Blair & Co. in 1922. The entire proceeds of this latter loan went to the State Railways. Later, in 1925, the company secured a short-term 6 per cent loan from the National City Bank amounting to \$5,800,000.

In the meantime, the electrification program had been completed, new equipment purchased, rates revised to produce a return on the cost of service, and exchange stabilized, so that toward the end of 1926 the State Railways were becoming well organized, both physically and financially. Operating expenses were curtailed considerably, and foreign indebtedness had been curtailed from 192,000,000 pesos in 1924 to about 152,000,000 pesos at the end of the calendar year 1927, and all this in spite of the servicing and amortizing of the contractual obligations.

As a result of its financial position and the general economic condition of the country the State Railways considered that it would be to its advantage to consolidate into one loan the outstanding foreign obligations. The recently acquired economic strength lead them to realize that they would be able to secure the new loan at 6 per cent, instead of 8 per cent as on the previous issues. As a result on August 11, 1927, the President of the Republic was authorized to contract a loan which would yield approximately \$41,000,000, of which amount about \$31,000,000 was for the account of the State Railways and \$10,000,000 for the account of the Treasury.

Under date of January 23, 1928, the Government contracted with the National City Bank for a loan of \$45,912,000 at 6 per cent, maturing January 1, 1961. A copy of this contract, and also decree No. 379 pertaining to the redemption of the loan is found in Appendix G. The net yield of this loan amounted to \$41,274,712. Under the terms of the contract, it was agreed that on March 1, 1928, \$8,662,500 was to be paid to the order of Blair & Co. for the purpose of redeeming the remainder of the \$10,500,000 loan of 1922. On May 21, 1928, \$16,830,000 was to be paid to the Guaranty Trust Co. for the purpose of redeeming the remainder of the \$24,000,000 loan of 1921. On February 10, 1928, the sum of \$5,800,000 was to be paid to the National City Bank for the short-term loan contracted in 1925. The balance of \$9,982,212 was to be distributed in two shares, the railway company to receive \$4,539,851 and the Treasury \$5,442,361. This

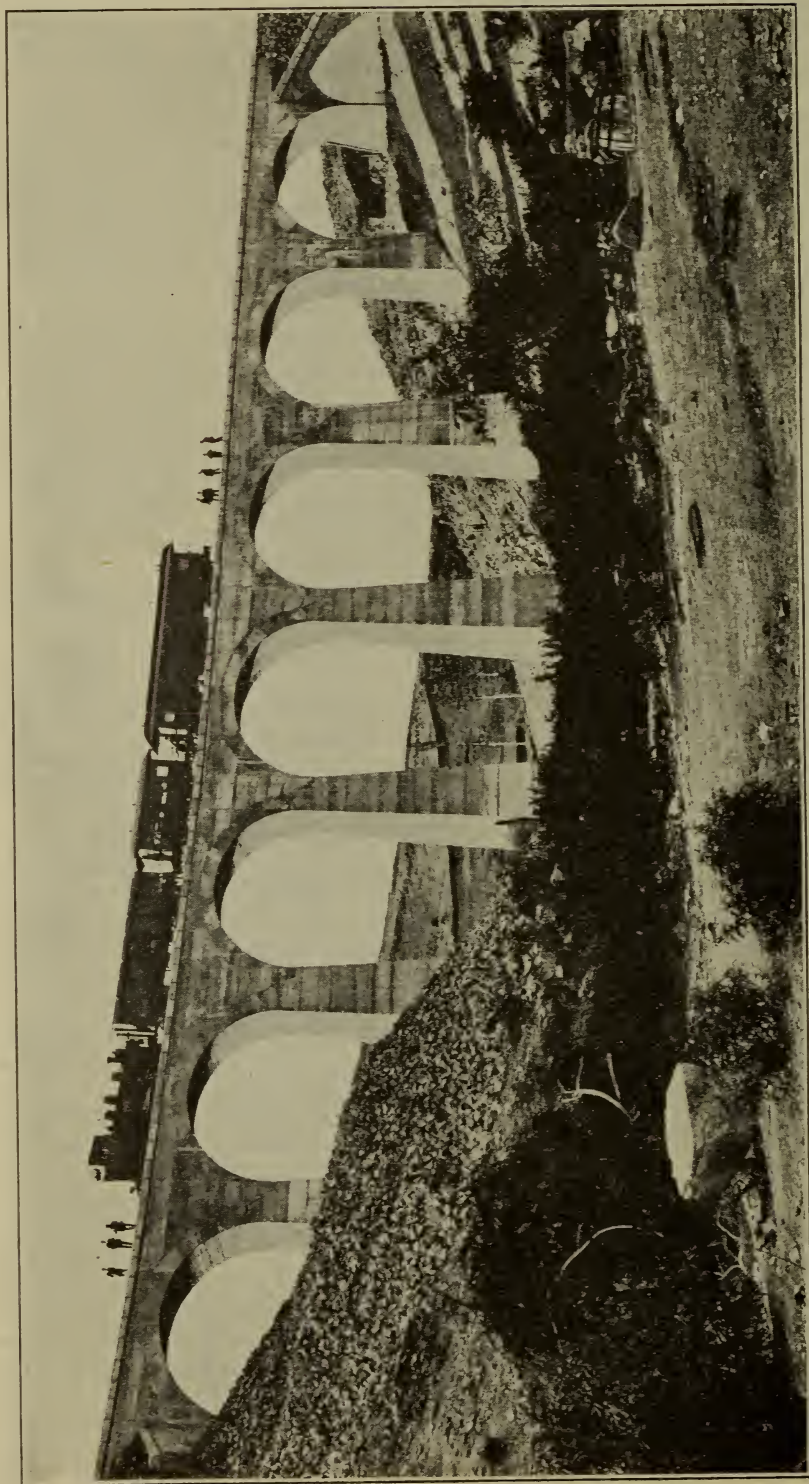


FIGURE 6.—La Colorado viaduct on the central system, Chilean State Railways

completely consolidated the outstanding railway loans and at the present time constitutes the foreign indebtedness of the State Railway System. The following tables contain balance sheets, profit and loss statements, and comparative operating data of the company for the years 1925, 1926, and 1927.

PROFIT AND LOSS STATEMENT FOR YEAR 1927 AS COMPARED WITH 1926 AND 1925

	1927	1926	1925
DEBIT	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
General administration expenses.....	13,701,496.43	16,930,173.28	11,487,952.03
Zone administration expenses.....	4,416,187.16	5,317,958.45	8,636,344.87
Works and ways expenses.....	15,818,908.46	16,504,988.57	15,197,577.23
Transport expenses.....	32,627,719.75	35,309,189.42	34,572,061.06
Traction expenses.....	49,330,107.38	50,202,331.36	48,983,273.13
Shop expenses.....	31,437,660.20	31,174,946.43	32,373,051.06
Social protection expenses.....	8,311,290.39	9,405,260.13	13,803,184.70
Distillation and bath expenses.....	28,268.43	30,310.02	30,136.98
Financial expenses.....	21,989,029.84	22,704,007.03	23,387,647.92
Expenses deducted from personal accounts.....	10,526,703.56		
Superannuation and pension expenses.....	12,845,545.67	9,187,644.17	
Depreciation made in accounts of works and ways, equipment, furniture, machinery, etc.....	23,464,070.00	22,364,070.00	23,711,252.04
Difference between value of equipment knocked down and set up.....	213,966.48	314,746.42	179,307.00
Difference in exchange.....		81,806.09	
Difference on sale of sundries, etc.....	12,997.40	8,722.56	
Reserves for final settlements.....	81,719.07	846,554.25	3,072,207.00
Contribution to state government.....	1,253,017.60		
Alameda station fire.....	300,100.00		
Profits for the year.....	226,358,787.82	220,382,708.18	215,432,995.07
	9,835,147.29	18,786,548.90	8,026,325.58
Total.....	236,193,935.11	239,169,257.08	223,459,320.65
CREDIT			
Income from traffic:			
Passenger.....	62,625,213.61	61,062,709.21	58,898,326.54
Baggage.....	9,102,787.20	9,823,556.20	8,929,488.40
Freight.....	160,835,855.85	165,164,287.06	152,077,761.36
Total income from traffic.....	232,563,856.66	236,050,552.47	219,905,576.30
Various entries.....	3,630,078.45	3,118,704.61	3,553,744.35
	236,193,935.11	239,169,257.08	223,459,320.65

GENERAL BALANCE SHEET OF CHILEAN STATE RAILWAYS ON DECEMBER 31, 1925

ASSETS

Ways and works, equipment, and plants, balance on Dec. 31, 1924:	<i>Pesos</i>	
Works and ways.....	553,013,156.21	
Equipment.....	180,141,109.82	
Shops and machinery.....	19,064,245.90	
Wharves and installations.....	736,523.15	
Various installations.....	2,139,733.12	
Plan of works and improvements on Dec. 31, 1922.....	32,394,119.36	
	787,488,887.56	
Funds invested in 1925:	<i>Pesos</i>	
Works and ways.....	17,335,188.81	
Equipment.....	13,224,624.70	
Shops and machinery.....	2,274,286.88	
Various installations.....	191,307.56	
	33,025,407.95	
	820,514,295.51	
Less reserve for renovations and depreciation:		
Balance on Dec. 31, 1924.....	62,530,455.12	
Added during 1925—	<i>Pesos</i>	
Works and ways.....	15,125,052.52	
Equipment.....	5,530,376.33	
Machinery and tools.....	2,631,823.23	
	23,287,252.08	
	85,817,707.20	<i>Pesos</i>
		734,696,588.31

GENERAL BALANCE SHEET OF CHILEAN STATE RAILWAYS ON DECEMBER 31, 1925—Continued

ASSETS—continued			
Furniture and fixtures:			
Balance on Dec. 31, 1924.....	Pesos	6,931,960.43	
Investments during year 1925.....		547,825.79	
			Pesos
			7,479,786.22
Less reserve for renovations and depreciation:			
Balance on Dec. 31, 1924.....		2,083,317.85	
Added during 1925.....		423,999.96	
			2,507,317.81
			Pesos
			4,972,468.41
Warehouses and materials:			
Inventory value.....		75,324,886.45	
Less reserve for losses and depreciation.....		5,323,044.33	
			70,001,842.12
			809,670,898.84
National ministries:			
Balance due—			
Currency.....		11,718,319.06	
American gold (\$111,881.62).....		925,261.00	
			12,643,580.06
Various debtors and pending accounts.....		7,863,041.83	
Bills, notes, and drafts collectible.....		1,622,746.30	
			9,485,788.13
Less reserve for doubtful and uncollectible balances.....		3,599,549.33	
			5,886,238.80
			828,200,717.70
Funds in bank, and cash and in transit:			
Pesos.....		3,376,668.88	
Pounds sterling (£66 13s. 7d.).....		2,687.16	
American gold (\$49,540.56).....		409,700.43	
			3,789,056.47
Deposits guaranteed by bonds and certificates of deposit:			
Certificates of deposit.....		13,597,252.08	
Bonds.....		86,700.00	
			13,683,952.08
Total.....			845,673,726.25
Profit and loss account:			
Balance on Dec. 31, 1924.....		72,848,811.07	
Less credit balance of account for 1925.....		8,026,325.58	
			64,822,485.49
			910,496,211.74

LIABILITIES

Capital as of Dec. 31, 1924.....		595,538,113.20
Operating funds as of Dec. 31, 1924.....		20,667,339.34
Foreign loans:		
8 per cent bonds.....	167,617,778.26	
Interest earned.....	4,582,184.36	
		172,199,962.62
Caja De Credito Hipotecario (Mortgage Bank):		
7½ per cent bonds.....	22,091,590.00	
Interest earned.....	259,963.32	
		22,351,553.32
Balances due the banks:		
Anglo South American Bank.....	848,166.26	
National City Bank.....	48,859,102.44	
		49,707,268.70
Various creditors and pending accounts.....		35,757,232.48
Guaranties:		
In bank certificates.....	13,597,252.08	
In bonds.....	86,700.00	
In cash.....	590,790.00	
		14,274,742.08
		910,496,211.74

GENERAL BALANCE SHEET OF CHILEAN STATE RAILWAYS ON DECEMBER 31, 1926

ASSETS

Ways and works, equipment, and plants, balance on Dec. 31, 1925:	Pesos
Ways and works.....	570,339,785.62
Equipment.....	193,365,734.52
Shops and machinery.....	21,736,523.15
Wharves and installation.....	347,092.18
Various installations.....	2,331,040.68
Works and improvements program up to Dec. 31, 1922.....	32,394,119.36
	820,514,295.51

GENERAL BALANCE SHEET OF CHILEAN STATE RAILWAYS ON DECEMBER 31, 1926—Continued

ASSETS—continued

Added during the year:			
Investments, ways and works.....	Pesos	13,309,979.81	
Investments, equipment.....		15,014,808.52	
Investments, shops and machinery.....		2,224,661.50	
Investments, various installations.....		110,764.82	
Renovations, ways and works.....		10,663,669.98	
Renovations, equipment.....		1,125,799.36	
			Pesos
			42,449,683.99
Less reserve for depreciation and renovations, balance on Dec. 31, 1925.....		85,817,707.20	
Added during 1926:	Pesos		
Ways and works.....	16,366,843		
Equipment.....	4,899,227		
Machinery and tools.....	848,000		
		22,114,070.00	
			107,931,777.20
Furniture and fixtures:			Pesos
Balance on Dec. 31, 1925.....	7,479,786.22		755,032,202.30
Added during 1926.....	616,663.82		
		8,096,450.04	
Less reserve for depreciation and renovations:			
Balance on Dec. 31, 1925.....	2,507,317.81		
Added during the year.....	250,000.00		
		2,757,317.81	
Warehouses and materials:			5,339,132.23
Inventory value.....	70,519,433.03		
Less reserve for losses and depreciation.....	548,271.10		
National ministries:			69,971,161.93
Less balance credit.....	7,752,482.66		
American gold (\$15,341).....	126,771.41		
			7,625,711.25
Various debtors, pending accounts, and drafts collectible.....	6,335,585.88		
Less reserve.....	2,369,011.35		
			3,966,574.53
Funds in bank and in transit:			
Pesos.....	2,131,673.59		
American gold (\$17,186.45).....	142,475.66		
			2,274,149.25
Deposits guaranteed by bonds and certificates of deposit:			
Certificates of deposit.....	11,984,289.14		
Bonds.....	102,700.00		
			12,086,989.14
Total assets.....			856,295,920.63
Profit and loss account:			
Balance on Dec. 31, 1925.....	64,822,485.49		
Less balance to credit of account during 1926.....	18,786,548.90		
			46,035,936.59
			902,331,857.22
LIABILITIES			
Capital:			
Balance on Dec. 31, 1925.....	595,538,113.20		
Incorporated into State railway system during 1925.....	3,403,584.65		
			598,941,697.85
Operating funds as of Dec. 31, 1925.....			20,667,339.34
Foreign loans (value in American gold):			
Eight per cent bonds.....	\$27,905,143.00		
Amortized.....	7,165,578.58		
Balance on Dec. 21, 1926.....	20,739,564.42	157,782,723.66	
Interest earned.....	523,972.45	4,327,196.69	
			162,109,920.35
Mortgage bank:			
Value of bonds, 7 per cent and 10 per cent loan.....	24,200,000.00		
Amortized.....	2,504,832.00		
Balance on Dec. 31, 1926.....	21,695,168.00		
Interest earned.....	253,101.32		
			21,948,269.32
Balance due the banks:			
Paper currency.....	14,467,572.18		
American dollars (\$5,801,005.08).....	48,090,332.11		
			62,557,904.29
Various creditors and pending accounts.....			23,258,293.49
Guaranties:			
In bank certificates.....	11,984,289.14		
In bonds.....	102,700.00		
In cash.....	761,443.44		
			12,848,432.58
			902,331,857.22

GENERAL BALANCE SHEET OF STATE RAILWAYS, DECEMBER 31, 1927

ASSETS		
Ways and works, equipment, plants, etc.:		
Balance Dec. 31, 1926—		<i>Pesos</i>
Ways and works.....	615,662,450.78	
Equipment.....	221,028,438.37	
Shops and machinery.....	25,516,274.10	
Wharves, installations, etc.....	736,523.15	
	<u>862,943,676.40</u>	
Added during year 1927—	<i>Pesos</i>	
Investments, ways and works.....	72,222,736.04	
Investments, equipment.....	16,441,694.88	
Investments, shops and machines.....	641,330.72	
Repairs, ways and works.....	11,570,618.63	
	<u>100,876,380.27</u>	
	963,820,056.67	
Less reserves for depreciation of capital and repairs:		
Balance Dec. 31, 1926.....	107,931,777.20	
Added during year 1927—	<i>Pesos</i>	
Ways and works.....	16,235,400.60	
Equipment.....	5,710,670.60	
Machinery and tools.....	1,088,000.00	
	<u>23,034,070.00</u>	
	130,965,847.20	<i>Pesos</i>
Furniture and fixtures:		832,854,209.47
Balance Dec. 31, 1926.....	8,116,753.14	
Added during 1927.....	694,816.90	
	<u>8,811,570.04</u>	
Less reserves for depreciation of capital and repairs:		
Balance Dec. 31, 1926.....	2,757,317.81	
Added during 1927.....	430,000.00	
	<u>3,187,317.81</u>	
	5,624,252.23	
Warehouses and materials:		
Value according to stock books.....	62,841,142.83	
Less reserves for depreciation.....	548,271.10	
	<u>62,292,871.73</u>	
Ministries of supreme Government:		
Balances due freight, passages, etc.—		
Debt consolidated to Dec. 31, 1924.....	3,630,298.99	
Owed subsequent to Dec. 31, 1924.....	5,086,126.60	
	<u>8,716,425.59</u>	
Less balance to credit American gold (\$29,619.17).....	241,692.42	
	8,474,733.17	
Various debtors, pending accounts, collectible documents.....	1,867,302.77	
Less reserves for definite liquidations.....	723,860.18	
	<u>1,144,442.59</u>	
Funds in banks and in transit:		
Chilean currency.....	1,379,898.64	
American gold (\$17,501.09).....	142,809.58	
	<u>1,522,708.22</u>	
Deposits in guarantee against:		
Certificates of deposit.....	10,432,591.78	
Bonds.....	101,200.00	
	<u>10,533,791.78</u>	
Total assets.....	<u>922,447,009.19</u>	
Profit and loss account:		
Balance Dec. 31, 1926.....	46,035,936.59	
Less balance to credit of account during 1927.....	9,835,147.29	
	<u>36,200,789.30</u>	
	958,647,798.49	
LIABILITIES		
Capital:		
Balance Dec. 31, 1926.....	598,941,697.85	
Delivered by Government to State railways.....	62,070,281.00	
Transfer of "exploitation funds" to Dec. 31, 1926, said funds representing value of materials, various debtors, and cash delivered by Government to State railways.....	20,667,339.34	
	<u>681,679,318.19</u>	
Foreign loans:		
Value of loans in American gold—		
8 per cent bonds.....	\$27,905,143.00	
Amortized.....	8,455,835.72	
	<u>19,449,307.28</u>	
Balance Dec. 31, 1927.....	147,966,689.00	
Interest earned.....	4,019,905.82	
	<u>\$19,938,670.83</u>	
	151,986,594.82	
Caja de credito hipotecario:		
Value of bonds of 7 per cent—1 per cent loan.....	24,200,000.00	
Amortized.....	2,929,542.00	
	<u>21,270,458.00</u>	
Balance Dec. 31, 1927.....		

GENERAL BALANCE SHEET OF STATE RAILWAYS, DECEMBER 31, 1927—Contd.

LIABILITIES—continued			Pesos	
Balances owed to banks:				
Chilean currency			16, 576, 227. 77	
American gold (\$6,283,965.21)			51, 277, 156. 11	Pesos
				67, 853, 383. 88
Various creditors, pending accounts, drafts payable, guarantees:				24, 832, 860. 68
In bank slips			10, 432, 591. 78	
In bonds			101, 200. 00	
In cash			491, 391. 14	
				11, 025, 182. 92
				958, 647, 798. 49

MOVEMENT BY PASSENGERS, BAGGAGE, AND FREIGHT FOR THE CALENDAR YEARS 1914 AND 1923 TO 1927, INCLUSIVE

Year	Passenger traffic			Baggage traffic			Freight traffic		
	Southern section	Northern section	Total central system	Southern section	Northern section	Total central system	Southern section	Northern section	Total central system
	Number	Number	Number	Tons	Tons	Tons	Tons	Tons	Tons
1914	13, 497, 483	(1)	13, 497, 483	37, 881	(1)	37, 881	4, 154, 643	(1)	4, 154, 643
1923	13, 168, 514	517, 384	13, 685, 898	47, 227	2, 845	50, 072	4, 548, 458	424, 575	4, 973, 033
1924	13, 678, 905	675, 278	14, 354, 183	48, 711	3, 199	51, 910	5, 096, 990	483, 129	5, 580, 119
1925	12, 408, 124	697, 712	13, 105, 836	43, 178	3, 829	47, 007	4, 803, 065	565, 391	5, 368, 456
1926	13, 372, 384	535, 685	13, 908, 069	48, 429	4, 905	53, 334	4, 593, 644	493, 942	5, 087, 586
1927	14, 165, 890	591, 789	14, 757, 679	46, 850	5, 269	52, 119	4, 471, 994	515, 859	4, 987, 853

¹ Northern section began operations in 1917.

RECEIPTS, IN PESOS, FROM PASSENGER, BAGGAGE, AND FREIGHT TRAFFIC DURING THE CALENDAR YEARS 1914 AND 1923 TO 1927, INCLUSIVE

Year	Receipts from passenger traffic			Receipts from baggage traffic			Receipts from freight traffic		
	Southern section	Northern section	Total central system	Southern section	Northern section	Total central system	Southern section	Northern section	Total central system
1914	20, 570, 744	(1)	20, 570, 744	2, 768, 062	(1)	2, 768, 062	36, 529, 826	(1)	36, 529, 826
1923	38, 444, 652	2, 637, 176	41, 081, 828	6, 790, 855	455, 472	7, 246, 327	114, 518, 339	6, 754, 875	121, 273, 214
1924	43, 231, 722	3, 036, 978	46, 268, 700	7, 201, 741	474, 014	7, 675, 755	128, 274, 197	6, 385, 800	134, 659, 997
1925	48, 241, 153	3, 473, 249	51, 714, 402	7, 431, 745	550, 019	7, 981, 764	140, 069, 443	7, 386, 062	147, 455, 505
1926	50, 723, 942	4, 025, 805	54, 749, 747	8, 101, 602	666, 683	8, 768, 285	149, 247, 111	8, 862, 916	158, 110, 027
1927	50, 854, 364	3, 873, 050	54, 727, 414	7, 297, 990	1, 035, 445	8, 333, 435	146, 949, 070	9, 360, 111	156, 309, 181

¹ Northern system began operation in 1917.

FREIGHT MOVEMENT, IN TONS, BY COMMODITIES, 1927 ¹

Commodities	Southern section	Northern section	Total central system
Agricultural products:			
Wheat	340, 372	5, 467	
Barley	61, 806	13, 480	
Oats	75, 399	29	
Beans	37, 195	5, 225	
Corn	22, 173	5, 149	
Various cereals	34, 721	2, 218	
Potatoes	125, 216	29, 987	
Fruits and vegetables		29, 748	
Imported fruit	3, 424		
National fruit	69, 864		
Vegetables	47, 636		
Hay and fodder	181, 082	23, 922	

¹ Detailed freight statistics are only available for the calendar year 1927.

FREIGHT MOVEMENT, IN TONS, BY COMMODITIES, 1927—Continued

Commodities	Southern section	Northern section	Total central system
Agricultural products—Continued.			
Flour and starch.....		12,990	
Wheat flour.....	88,973		
Other flours and starches.....	42,618		
Tobacco.....	13,125		
Total.....	1,143,604	128,209	1,271,813
Forest products:			
Unfinished slamo.....	59,256		
Unfinished laurel.....	58,173		
Unfinished rauli.....	71,088		
Unfinished roble.....	181,984		
Other unfinished native lumber.....	97,146		
Native woods elaborated.....	17,363		
Imported lumber.....	1,567		
Charcoal from espino and talhuer.....	29,875		
Charcoal made from unfinished woods.....	35,561		
Fuel of espino and talhuer.....	8,303		
Fuel of unspecified woods.....	107,382		
Lumber.....		6,475	
Charcoal and firewood.....		29,700	
Total.....	667,698	36,175	703,873
Mineral products:			
Copper bars.....	102,960		
Copper ore.....		38,847	
Ores in general (including concentrates).....	31,878	24,606	
Coal.....		3,639	
Coal (large lumps).....	134,069		
Coal (small lumps).....	29,224		
Powdered coal, coke.....	116,745		
Liquid and semiliquid combustibles and lubricants.....	91,463		
Fertilizers.....	45,996	3,290	
Lime and cement.....		96,083	
Lime, limestone, and plaster.....	9,909		
Cement.....	148,976		
Quarry materials.....	15,940		
Construction materials.....	16,061		
Salt.....	37,062		
Total.....	780,283	166,465	946,748
Livestock and products:			
Horses, asses, and mules.....	3,970	1,102	
Cattle.....	157,643	9,159	
Sheep and goats.....	20,963	457	
Hogs.....	9,597	394	
Milk.....	28,956	754	
Cheese and butter.....	5,008		
Other livestock products.....	26,943		
Total.....	253,080	11,866	264,946
Manufactured products:			
Canned fruits, vegetables, sausages, and shellfish.....	18,010		
Products of textile industry.....	11,440		
Hardware.....	98,365		
Machinery and tools.....	29,760		
Machinery, vehicles, and instruments.....		2,774	
Automobiles, carriages, and vehicles of animal or mechanical traction.....	12,213		
Paper and cardboard.....	23,530		
Sugar.....	66,377	3,735	
Beer.....	24,298	1,597	
Alcohol and liquor.....	6,088	1,122	
Wine.....	168,789	2,353	
Mineral water.....	6,066		
Furniture and household goods.....	30,296	7,151	
Containers.....	176,137		
Dangerous articles.....	11,193		
Total.....	682,562	18,732	701,294
Various.....	239,035	78,551	317,586
Total cargo traffic.....	3,766,262	439,998	4,206,260
Total railway service traffic.....	705,732	75,861	781,233
Grand total.....	4,471,994	515,859	4,987,853

TRAFFIC

The southern section of the central system which extends from the tip end of Chile longitudinally along the coast connecting the ports of Valparaiso and Santiago with the transandean route to Argentina, is the most profitable section of the State Railway System. The northern section, extending northward from La Calera longitudinally with the coast to Iquique obtains less traffic than the southern section, owing for the most part to the fact that it passes through less populated areas and also comes in more direct conflict with coastwise shipping. It is dependent for the most part on mining and agricultural products and in certain instances is in direct competition with industrial lines.

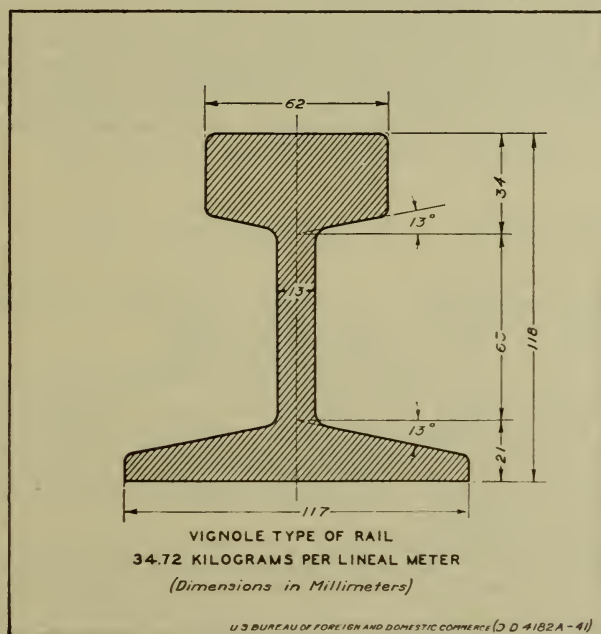


FIGURE 7.—Rail profile, Chilean State Railway

SOUTHERN SECTION

RIGHT-OF-WAY CHARACTERISTICS

In this discussion of right-of-way characteristics, data pertaining only to the Red Central Sur (southern section) will be included under the various headings. Some of the data will be divided into the four management zones under which this section of the central system of the Chilean State Railways was formerly operated. This is done in order to establish right-of-way characteristics for as small amount of line as possible.

Operating zones.—The four zones into which the southern section was formerly divided are: Zone 1, with headquarters in Valparaiso, included lines operating from La Calera to Valparaiso, and to Santiago with branches; zone 2, with headquarters in Santiago, included the track from Santiago to Talca and branches (the Ferrocarril Puente Alto al Volcan although in this zone is operated separately); zone 3, with headquarters in Concepcion, included the track from Talca to San Rosendo and Concepcion to Temuco with branches; and zone 4, with headquarters in Valdivia, included the right of way from Temuco to Puerto Montt, and the line on the island of Chiloe from Ancud to Castro and branches.

Gage.—The principal gage of the southern section is of 1.676 meters. Both 1 meter and 0.60 meter gage are also used.

Altitude.—The southern section operates lines from 11 meters to 805 meters above sea level which is the highest point on the system.

Grades.—The maximum upgrade in this section is found in zone 4 and is of 4.2 per cent for a distance of 350 meters on the 0.60-meter gage track while the maximum down grade is 3.6 per cent for a distance of 1,720 meters in the same zone and on the same gage. The maximum down grade on lines of the same gage is also in the same zone and is 2.25 per cent for a distance of 17,514 meters. The maximum upgrade on the 1-meter gage track is located in the first and second zones and is of 2.26 per cent for a distance of 525 meters while the maximum down grade is 1.3 per cent for a distance of 320 meters.

Curves.—The sharpest curve found on this system is located on the 0.60-meter gage track in the fourth zone and has a minimum curve radius of 15 meters. The minimum radius of curves on the 1-meter gage track is 80 meters located in both the first and second zones, while the minimum radius of curves on the 1.676-meter gage track is 150 meters found in the first zone. Other sharp curves found on the latter gage have minimum radii of 180, 200, 220, and 300 meters and are located in all four zones.

Rails.—There are 10 different types of steel rails in use on this section, varying from 20 to 50 kilograms per meter in weight, and ranging from 6 to 12 meters in length. Rails recently placed in the first zone and the electrified section of the line between Valparaíso and Santiago weigh 50 kilograms to the meter. Of the types in use, probably the most common one is that weighing 34.72 kilograms per meter. A drawing of this rail is shown. The following table shows the various types, weights, and lengths of rails used on this section.

Type	Length	Weight per meter	Type	Length	Weight per meter	Type	Length	Weight per meter
	<i>Meters</i>	<i>Kilograms</i>		<i>Meters</i>	<i>Kilograms</i>		<i>Meters</i>	<i>Kilograms</i>
A-----	9. 15	43. 90	E-----	9. 15	34. 75	S-----	8. 00	15. 15
B-----	9. 15	39. 80	F-----	10. 00	30. 00	T-----	6. 00	20. 45
C-----	12. 00	38. 50	G-----	10. 00	39. 80			
D-----	12. 00	39. 80	P-----	10. 00	25. 50			

Ties.—Wood ties are used exclusively on this section. The ties vary in size depending on the gage of the track. On the 1.676-meter gage track, ties are of 2.75 by 0.20 by 0.15 meters, spaced 1,450 to the kilometer. On the 1-meter gage track, ties used are 1.80 by 0.20 by 0.15 meters and spaced 1,380 to the kilometer. On the 0.60-meter gage track the ties used are 1.30 by 0.20 by 0.125 meters and spaced 1,300 to the kilometer.

Water.—Water is secured principally from wells, although some is obtained from neighboring streams. There are 156 water stations located an average distance apart of 17.7 kilometers. Both concrete and iron tanks are used for storage purposes.

Ballast.—The line is well ballasted with crushed stone about 2 centimeters in circumference. Likewise, sifted gravel or stones slightly smaller than the crushed stone are used. The ballast is renewed as occasion demands.

Signaling equipment.—The electrified line of the southern section of the central railway system has the only modern signaling system in use. This equipment consists of the alternating-current track circuit and two position day and night light signals with block apparatus and impedance bonds which were supplied by the Union Switch & Signal Co. The mechanical levers, point rodding, and point locks were supplied by the Westinghouse Brake Co. and Saxby Signal Co. of Great Britain. The Western Electric selector system has been installed on the sections between Valparaíso and Osorno, including the Talcahuano and San Antonio branches. The line wires for these circuits are of hard-drawn copper supported on steel bolts and unbreakable insulators carried on cross arms and revolved circuits. Duplex telegraph circuits have been superimposed in various sections of the selector lines. It is planned to extend the alternating-current track circuit system through the southern section as rapidly as possible.

The remainder of both sections of the central system are equipped with the block system of a primitive type.

It consists of a signal post located approximately at the center of each station, carrying double semaphore arms and spectacles of 2-colored glass, namely, green and red. In operation the signal is in reality a 3-position one, since when the semaphore arm is lowered to the clear position—i. e., vertical with the main post—the spectacle castings are raised above the signal lamp, thus exposing a white

light, or clear position. When the semaphore arm is lowered to the 45° position, the green glass is raised to a position in front of the signal lamp, showing a green light. The third, or danger position, is arm at horizontal and red glass focussed before the signal lamp.

The Morse inker telegraph system is employed for the dispatching of trains. Usually three to four stations are on one circuit in parallel and all train-control messages are taken on the tape for the purpose of recording the movements. In general, throughout the system the Leclanche cell type battery, known as No. 2, of approximately 20 ampere-hours capacity, is used. Some of these cells are purchased from local vendors, but the major portion is manufactured in the workshops of the railway. The quantity varies from 30 to 160 cells per station and averages about 50 per station, with approximately 350 stations on main line and branches of the 1.676-meter gage, amounting to about 3,000 kilometers. The telephone system is in general the magneto system, which is used in all the largest stations, varying from 25 to 130 line boards. The total number of instruments of this kind would not amount to more than 700 and are of various types.

Recently the Chilean State Railways inaugurated extensive improvements in this method of dispatching and some work has been accomplished. It is understood that apparatus has been purchased to superimpose duplex telegraph circuits on various sections of the lines. Series working on the telegraph circuits will be adopted, and over the electrified area these circuits will be metallic and,

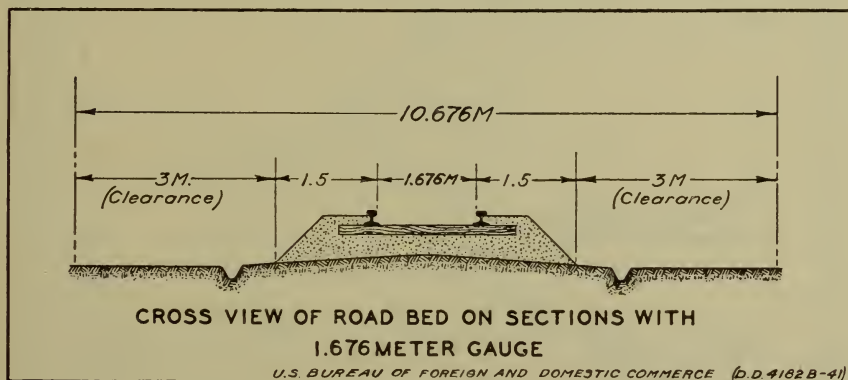


FIGURE 8.—Cross view of roadbed on Chilean State Railways

where obtainable, power will be used instead of batteries. Dry cells are being seriously considered to replace the Leclanche cells where other power is not available. This consideration has been brought about owing to the costly attention, loss of material, and breakages when using Leclanche cells. In Santiago and Valparaiso paper cables have been laid in concrete ducts for the signal, telegraph, and telephone system.

Clearances.—The diagram shown is that prevailing on the 1.676-meter gage track.

Maintenance.—The roadbed is kept in good condition, particularly the sections which have been electrified. These sections are especially reinforced to withstand heavy traffic.

Culverts and small bridges.—There are 6,124 culverts and small bridges in use, with an aggregate length of 12,505 meters.

Bridges.—At the end of the calendar year 1926 there were 415 bridges with an aggregate length of 25,598 meters. The largest proportion of these bridges are found in the third zone, which aggregates about 10,500 meters of the total aggregate length.

Tunnels.—At the end of the calendar year 1926 there were 28 tunnels in use, extending a distance of 7,801 meters. The largest percentage of these tunnels is found in the second zone and amounts to approximately 3,200 meters in length. Some of the tunnels are of masonry and others are cut out of natural rock. In the electrification scheme it was necessary to rebuild five of these tunnels.

CAR-LIGHTING EQUIPMENT

The majority of the passenger cars used, by both the northern and southern sections of the central system, are electrically lighted, and the remainder are equipped with paraffin or acetylene lighting equipment, while a few have no lighting system. Of the electrically lighted cars, the majority are equipped with generator drive from axles while the rest are connected with other cars having axle generators. The principal generators used are the Stone (British) and Bliss

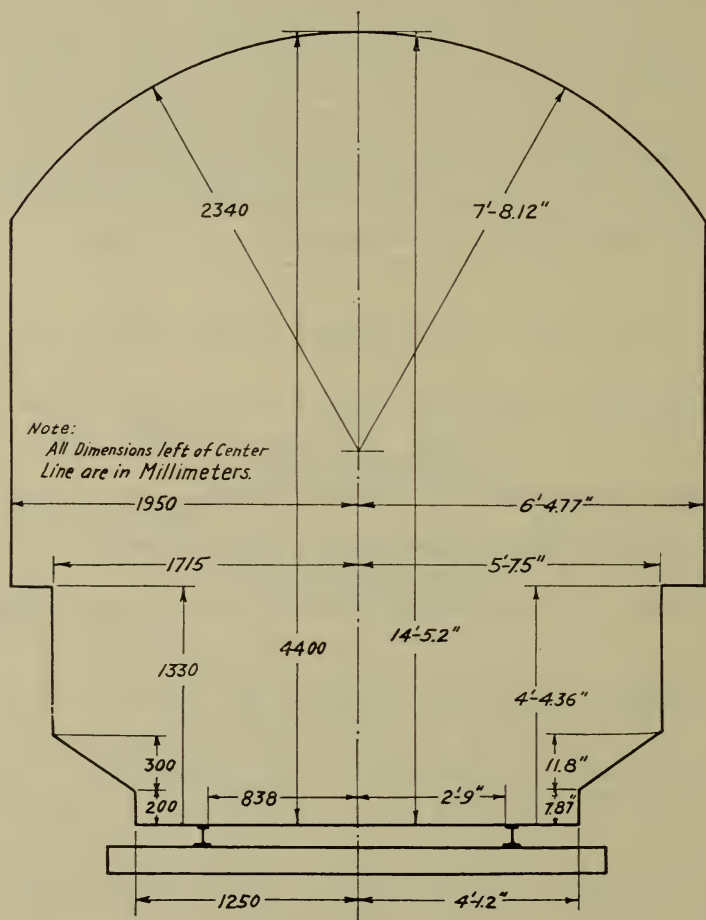


FIGURE 9.—Clearance diagram for Chilean State Railways

types. The approximate cost of a complete unit with the accumulators is 4,000 Chilean pesos. The cars which are equipped with accumulators have a set of "Tonum" or a similar type, each element being composed of five positive and six negative plates. Each car has two batteries of 12 elements each, while its discharging voltage is 2 volts and capacity is 150 ampere-hours. The number of lamps used varies according to the type of car; generally there are 15, with a capacity of 12 watts each. The cars usually have two ventilator fans of varying sizes.

TRACTION POWER

Imported and Chilean coal, gasoline, oil, electricity, and wood are used for traction power. There are 40 coal stations located an average distance of 73.5 kilometers apart. Chilean coal is about 20 per cent less efficient than that mined in the United States, although some analyzes almost as well. For example, the analysis of coal obtained from two of the leading mines is as follows: Fixed carbon 52 per cent, volatile 38½ per cent, ash 5 per cent, sulphur 1½ per cent, and moisture 3 per cent. Coal is used for fuel for the most part in what was formerly known as the second and third zones, while wood is the fuel more commonly used in the fourth zone. Electric power is utilized for the most part in the first zone. Gasoline is used in connection with the operation of self-propelled vehicles on short hauls for passenger traffic. The latter for the most part pertains to all four railway zones.



FIGURE 10.—Map showing State railways electrified

ELECTRIFICATION

Conditions that were created in Chile during the World War brought forcefully to the attention of the management of the State Railway system the necessity for electrifying certain of their lines. This resulted in the electrification of the Valparaiso–Santiago line and the Los Andes branch which connects with the Transandine Railway. Recently the management decided to electrify certain additional lines in the southern section of the central system, including the lines from Santiago to Puerto Montt and to Puerto San Antonio. No contracts have yet been let for this work.

During the World War period coal had increased in price to \$25 per ton and even after the peak was reached, it remained around \$15 to \$20 per ton for steam grades. Small locomotives used on the system were so burdened with increased traffic that they could not clear tracks with any length trains over the heavy grade divisions. In 1918, Engineers Rafael S. Edwards and Ricardo Solar P. were commissioned to make an exhaustive study of this situation. Their report which was finished in the same year recommended the expen-

diture of about 180,000,000 pesos for the electrification of the above sections. As a result of their recommendations, tenders were solicited in 1921 for the electrification of the lines and the supply of materials for substations and locomotives. Bids were submitted by the Westinghouse International Co., General Electric Co., Siemens Schuckertwerke, and the Oerlikon Shops of Switzerland. The contract was awarded to the Westinghouse Co. for the entire installation. This contract amounted to 82,169,268 pesos for the work and approximately 57,518,482 pesos for the electrical equipment and erection. The latter was the Westinghouse contract. In addition a power contract was entered into with S. Pearson & Sons (Ltd.) on behalf of the Chilean Electric Tramway & Light Co. (Ltd.). This contract on definite terms was valid for a period of 22 years with privilege of renewal for 5-year periods. The railways guaranteed an annual consumption of 30,000,000 kilowatt hours.

The scope of the electrification involved the construction of 187 kilometers of track from Valparaíso to Santiago, which was opened

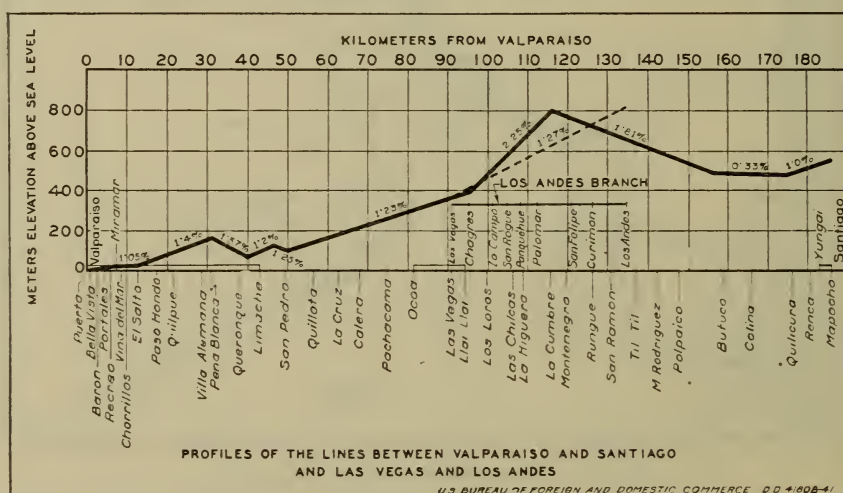


FIGURE 11

to traffic in 1924, and 45 kilometers from Las Vegas to Los Andes. These, together with sections which were double-tracked, and sidings, totaled 374 kilometers of 1.676-meter gage track. The maximum grade on this electrification was 2.25 per cent at the approach to La Cumbre from the west. There are also a large number of curves, with the maximum being 10° . There are six tunnels, located at Los Maquis, Los Loros, Centinela, San Pedro, and two at Paso Hondo. With the exception of the tunnel at Paso Hondo, all tunnels were cut through loose earth and brick lined. The longest is the San Pedro Tunnel, which is 487.68 meters long. All the tunnels had to be increased in height in order to accommodate overhead wires. The general details of this electrification program are as follows:

Generating stations.—The origin of the high-tension alternating-current power is at the new Maitenes plant of the Compañía Chilena de Electricidad, Limitada. This plant is located on the Colorado River, which has its source near Mount Tupungato with an elevation of 6,858 meters.

A special intake is used for diverting the water in such a way as to eliminate the rock and gravel, which is carried down owing to the rapid flow of the river. The intake is of masonry construction provided with gates for flushing and controlling the amount of water directed to the canal. This intake is located at Alfalfal, approximately 6.68 kilometers above the power house at Maitenes. Steel penstocks carry the water down to the generating station through a head of 176.78 meters. The penstocks are anchored and supported by concrete construction in the form of individual bases for each penstock.

The Maitenes station is located at an elevation of 1,136.294 meters above sea level. The exterior of the building is of masonry construction, utilizing the ellipsoidal-shaped stones so plentiful in this district, while the interior is of reinforced concrete. It houses the turbines, generators, and switchboards. The high-tension switching equipment and transformers are of the outdoor type.

The station contains three 8,125-kilovolt ampere, 6,600-volt, 3-phase, 50-cycle, 600 revolutions per minute, water-wheel generators. Each generator is directly connected to a shunt-wound exciter of 62 kilowatts capacity at 125 volts.

The generators are driven by Pelton water wheels of the horizontal overhung single discharge turbine type, operating at a head of 176.78 meters.

The voltage at the generating station is stepped up from 6,600 to 110,000 volts by three 6,000-kilovolt ampere, single phase, oil insulated, water-cooled transformers of the outdoor type. All circuit breakers and high-tension switches for the 110,000-volt switching are also of the outdoor type. The panel board and metering equipment are located on a balcony within the building.

In case of failure of the Maitenes station at any time, power for the electrified zone of the railways can be obtained from the Florida station, a hydroelectric station located near Santiago, or from the Mapocho steam station located in Santiago. The capacity of the Florida station is 15,000 kilowatts and that of the Mapocho station approximately 20,000 kilowatts. Both of these stations ordinarily supply the city of Santiago.

Transformer stations.—The San Cristobal receiving station is located at Santiago, 59.54 kilometers from Maitenes, and serves as a switching and step-down station, stepping down from 110,000 to 12,000 volts for the supply of the railway substation at Quilicura. The receiving station contains four 7,500-kilovolt ampere, 3-phase, 50-cycle, oil insulated, air-cooled transformers and high-tension switching equipment, all of the outdoor type. This station also serves for the power supply for the city of Santiago. The 110,000-volt transmission line also extends from San Cristobal to Limache and thence to Miraflores, near Valparaíso.

The Los Vegas station contains three 7,500-kilovolt ampere, 3-phase, 50-cycle, oil insulated air-cooled transformers. These step down from 110,000 to 44,000 volts and are for supplying the railway substations at Llai Llai, Rungue, and San Pedro. The transformers and switching equipment are of the outdoor type. The line sectionalization and the transformers are controlled by 3-pole, single-throw, circuit breakers. Eight-circuit breakers control the 110,000-volt oil line, while 12 control the 44,000-volt line.

The Miraflores station is also equipped to step down from 110,000 to 12,000 volts for the supply of the railway substation at Vina del Mar. This station contains four 7,500-kilovolt ampere, 3-phase, 50-cycle, oil insulated, air-cooled transformers and six 3-pole, single-throw circuit breakers, all of the outdoor type. The city of Valparaiso also obtains its power supply from this station.

Transmission line.—For the 59.54-kilometer line between the Maitenes generating station and the San Cristobal receiving station a 2-circuit line of No. 2-0 copper is used to transmit the power at 110,000 volts, 3-phase, 50 cycles. Between San Cristobal and Limache, a distance of 107.82 kilometers, power is transmitted at 110,000 volts over a 2-circuit line of No. 3-0 aluminum steel core conductor. From Limache to Miraflores, a distance of 35.405 kilometers, twin circuit of No. 0 copper conductor is used. From Las Vegas to the railway substations at Llai Llai, Rungue, and San Pedro,

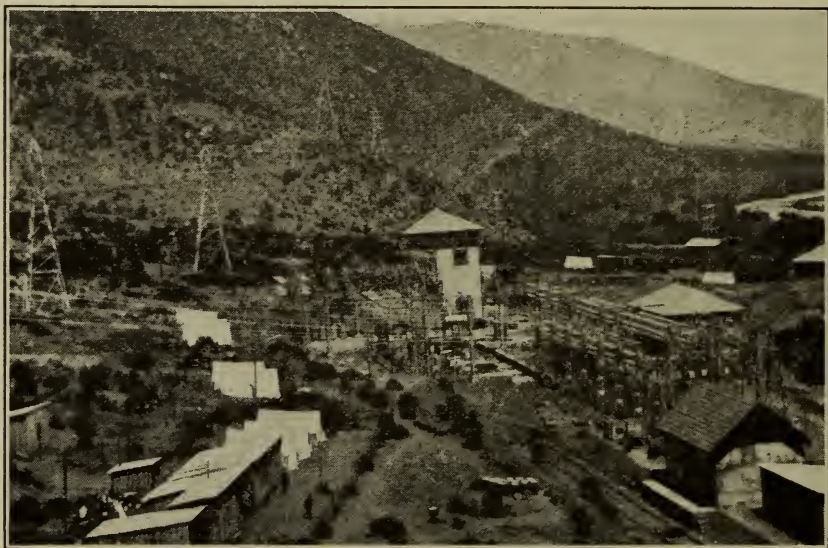


FIGURE 12.—General view of Los Vegas, central system, Chilean State Railways

the 44,000-volt power is transmitted over a 2-circuit line using No. 2-0 aluminum steel core conductor.

The 110,000-volt transmission line carries a $\frac{5}{16}$ -inch high-strength steel-ground wire. On the section where aluminum conductor is used, the normal span length is 299.92 meters, while the maximum span is 609.60 meters. The normal horizontal spacing of conductors is 5.33 meters, while the vertical spacing is 2.89 meters. The middle wires are offset 91 centimeters horizontally in order to avoid having conductors come in contact in case snow or sleet should drop from one of the lower wires causing it to swing against the conductors above. The twin circuit transmission lines for the 110,000-volt system are carried on steel towers of sufficient height so that the lowest cross arm is 14.09 meters from the ground. The transmission line carrying 110,000-volt power takes a course westward from the receiving station at San Cristobal, crossing the railroad near Til Til, continuing in the same direction to Las Vegas, from which point it

takes a southwesterly direction to the Miraflores step-down transformer station. The total length of the line between San Cristobal receiving station and Miraflores step-down station is approximately 143 kilometers.

Substations.—There are five railway substations located as follows: No. 1, Vina del Mar; No. 2, San Pedro; No. 3, Llai Llai; No. 4, Rungue; No. 5, Quilicura.

Each substation building is of reinforced concrete, having a motor-generator room and a high-tension room. The motor-generator rooms are equipped with overhead cranes, while the high-tension rooms have facilities for raising the transformer cores from their cases by chain blocks. The basement of each building provides ample space for the control switching equipment.

Each substation contains two Westinghouse 2,000-kilowatt motor-generator sets, each set consisting of a 2,840-horsepower, 50-cycle, 3-phase, 2,300-volt synchronous motor and two 1,000-kilowatt, 1,500-volt generators connected in series. Exciters are mounted at either end of the set on shaft extensions, provided with flange connections for bolting. The exciter for the synchronous motor has a rating of 28 kilowatts at 125 volts and for the direct-current generator a rating of 10 kilowatts at the same voltage. The motor-generator sets are capable of withstanding a 200 per cent overload for five minutes without being injured. To provide additional protection against flashovers on heavy overloads, the sets are equipped with "flash suppressors." The suppressors consist of a set of small contactors arranged to short circuit the armature windings of the generator, thus reducing instantaneously the voltage between commutator bars to practically zero and suppressing the flash.

For each motor-generator set there is provided a 2,500-kilovolt ampere, 44,000/2,300-volt, oil-insulated, self-cooled core type transformer, with 44,000-volt bus oil switches and 2,300-volt motor control switches.

The supply voltage for auxiliary light and power is taken from the 2,300-volt side of the main transformer through a 2,300-volt "selector" oil switch and fed to a 37½-kilovolt ampere, 3-phase, 50-cycle transformer, which furnishes power for the automatic blowers for ventilating the motor-generator sets as well as power for lighting and other auxiliary purposes.

In each substation a 3,000-volt switchboard is located at one end of the motor-generator room with the high-voltage switches on the balcony, and operating panels, battery panel, and power indicating and limiting apparatus on the main floor. The synchronous motor panels, incoming line panels, transformer panels, and station service panels are mounted in the dividing wall between the two rooms in each station. All incoming lines have disconnecting switches and high-tension oil circuit breakers between the station high-tension bus and the line. All stations contain high-voltage bus bars, oil circuit breakers, and choke coils. Disconnecting switches are provided between the bus bars and transformers.

For the purpose of measuring, indicating, and recording the total amount of power supplied by the transmission system to the several substations, particularly the maximum amount of such power, and also for the purpose of limiting the amount of this maximum demand

within certain predetermined limits, a power indicating and limiting system is used.

Yard feeder switches have been placed at each substation to permit the direct current power to be cut off from any substation, and connect the two sections of the line in order to feed by a single main station.

The three intermediate substations are connected by the 44,000-volt transmission line, of which each substation bus forms a part, and which is sectionalized by means of oil circuit breakers. These breakers are equipped with power relays, so arranged and set that in case of trouble on any particular section of the transmission line between two oil switches, these switches will automatically open and disconnect the faulty section of the line from the substations without interrupting the supply of power to more than one substation.

The overhead system.—The overhead trolley is of the simple catenary type of construction with flexible hangers, which support the No. 4-0 single contact wire from a $\frac{3}{8}$ -inch steel messenger cable. The overhead construction has a span of 60 meters with hangers spaced 5 meters apart. The hangers consist of two pressed steel jaws attached to a looped hanger rod of $\frac{5}{16}$ -inch cold-rolled steel. Hangers vary in length from 6 to 33 inches. The trolley wire is suspended at a height of 6 meters above the rails, except at tunnels where it was necessary to reduce this height.

The $\frac{3}{8}$ -inch steel messenger wire is supported by pin type porcelain insulators except in tunnels where the interlinking type is used. Wooden insulating shields are installed around the bracket arm immediately below the messenger insulator so that in case the messenger is pulled out of its insulator groove it will be prevented from grounding by this shield.

On single-track tangents, also on double-track tangents and curves of long radius, bracket-arm construction supported from reinforced concrete poles is used. The brackets are of T-section $2\frac{3}{4}$ by $2\frac{3}{4}$ inches sherardized steel. Cross span construction is used exclusively on double track on curves of short radius and in freight and switching yards.

The feeders are of all aluminum 37-strand cable of approximately 600,000 circular mils. They are supported on pin-type insulators mounted on wooden cross arms on the concrete poles. The power indicating and limiting wires, also of aluminum, are also carried on the cross arms on pin-type insulators.

There is an insulated air gap at the beginning and end of every passing track and a sectionalizing switch in the feeder, so that in case of trouble on any portion of the trolley system the sectionalizing switches at either end of the damaged portion may be opened and traffic allowed to proceed in either direction to the stations at which the switches have been opened.

Both rails are bonded with No. 4-0 Brown & Sharpe (211,600 circular mils) arc weld bonds over the entire route except between Llai Llai and Yungai, where 300,000 circular mils welded bonds are used. On yard tracks the joints of only one of the rails is bonded with No. 4-0 Brown & Sharpe arc weld bonds.

Electric freight type locomotives.—There are 15 electric freight locomotives, each weighing 230,000 pounds, all of which is carried on six driving axles. They are of the 0-6-0+0-6-0 type, having

two 3-axle trucks connected with a "Mallet" hinge. The frames are of the cast steel bar type and there is a box cab superstructure. Each of the driving axles carries a 300-horsepower, 1,500-volt field control motor, insulated for 3,000 volts line voltage. The motors are geared directly to the axles with "Nuttall" flexible gears. High continuous capacity is provided in the motors by forced ventilation. The control equipment is of the electric pneumatic, hand-operated type and provides for field control of the motors and regeneration. The voltage for the control circuits is obtained from a 3,000/90-volt motor-generator set. The motor-generator set provides current for exciting the traction motor fields during regeneration as well as power for the auxiliaries such as the compressor motors, blower motors, lights, and heaters. The control is arranged to obtain three separate combinations by connecting the motors in series and in parallel. Three additional speeds are obtained by varying the fields of the motors. The range of speed during regenerative braking is from 8 to 31 miles per hour. The locomotives are also equipped with Westinghouse straight air brakes and automatic brakes are available for locomotive and train. Air for the brake equipment is supplied by two compressors, each of 50 cubic feet per minute displacement, operated from the low voltage side of the motor generator set. The current collectors consist of two spring-raised, air-lowered double-shoe pantographs. The locomotives are operated from either end, and multiple operation of two locomotives can be controlled from any master controller.

ROAD FREIGHT LOCOMOTIVES

Total weight of unit.....	230,000 pounds.
Classification of wheels.....	0-6-0+0-6-0.
Weight on drivers.....	230,000 pounds.
Number of driving axles.....	6.
Number of idle truck axles.....	0.
Total weight on idle trucks.....	0.
Capacity at 1-hour rating.....	1,800 horsepower.
Maximum starting tractive effort.....	84,000 pounds.
Tractive effort—hourly rating.....	31,200 pounds.
Speed—hourly rating.....	21.5 miles per hour.
Tractive effort—continuous rating.....	24,360 pounds.
Speed—continuous rating.....	23 miles per hour.
Maximum speed.....	44 miles per hour.
Total wheel base.....	37 feet.
Rigid wheel base.....	13 feet 9 inches.
Length over all (between bumpers).....	49 feet 9½ inches.
Width over all.....	10 feet 6¾ inches.
Height from rail to locked position of pantograph.....	14 feet 47/16 inches.
Diameter of driving wheels.....	42 inches.
Diameter of idle truck wheels.....	0.
Voltage and type of collector.....	3,000 volts direct current, overhead.
Gage.....	5 feet 6 inches.
Number and type of motors.....	6, type 350 D5.
Method of drive.....	Flexible gear.
Gear ratio.....	15:63.
Type of control.....	Electropneumatic (HGFR).
Number of this type of unit in service.....	15.

The service of each locomotive consists of hauling a 770-ton train made up of 30 to 35 cars, in either direction between Baron and Yungai, assisted by a helper locomotive of the same capacity on the

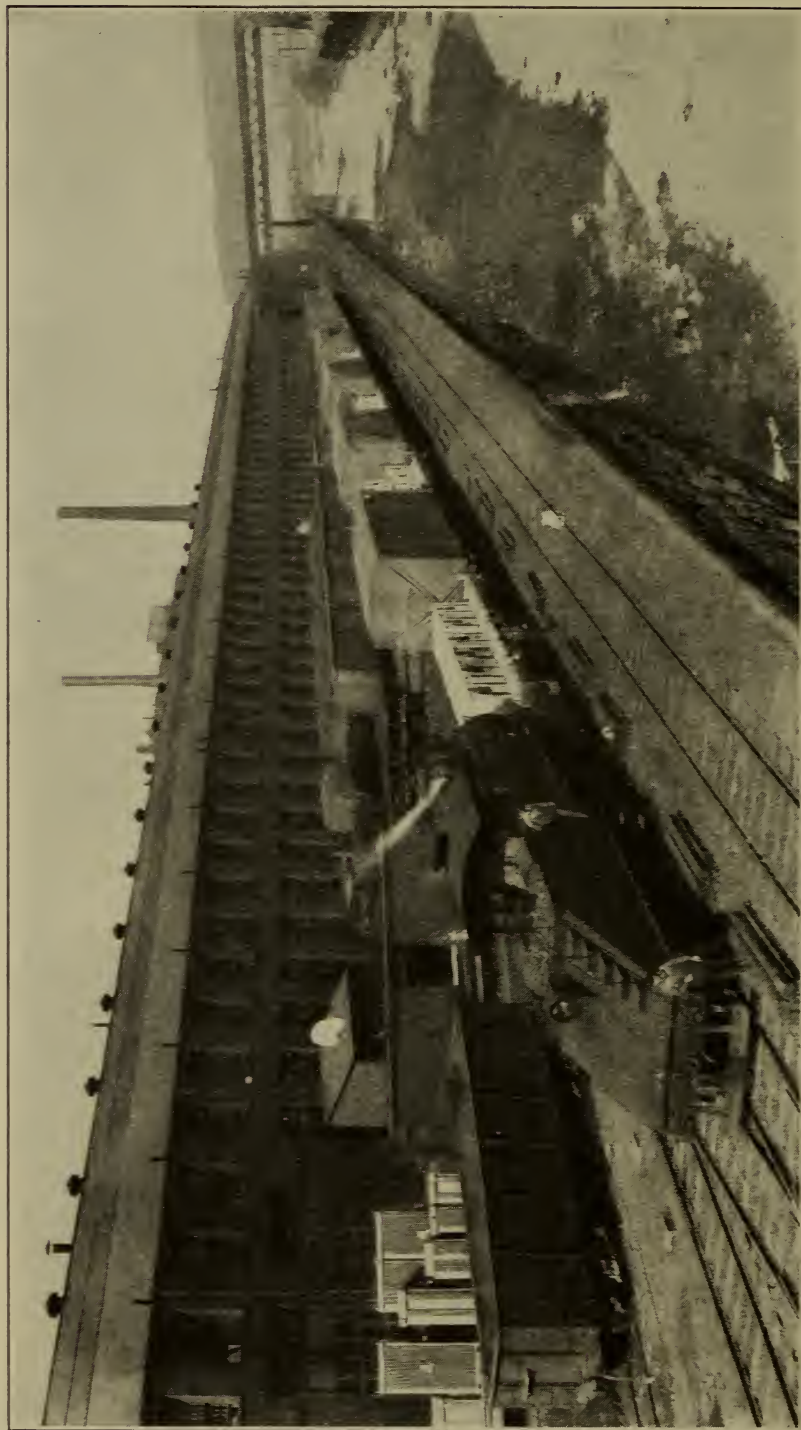


FIGURE 13.—Shipment of electric locomotives leaving a plant in the United States for the Chilean State Railways

2¼ per cent Tabon grade. Between Llai Llai and La Cumbre on the southbound run, the free running speed on level tangent track when hauling a 770-ton train is 32 miles per hour with 2,700 volts at the trolley. On the Tabon grade, the average running speed at the same voltage and with the same trailing load is 24 miles per hour.

Electric express passenger type locomotives.—There are six electric locomotives used in express passenger service. Each of these locomotives has a rating of 2,400 horsepower, and weighs 259,800 pounds. The wheel arrangement is 2-6-0+0-6-2, consisting of two main trucks, each of which has three driving axles and a 2-wheel guiding truck. The trucks are connected at the inner ends by a drawbar and spring buffers.



FIGURE 14.—San Miguel Bridge between Alcones and Pichilemu, central system, Chilean State Railways

The frames are of the cast steel bar type, located outside of the wheels, connected by cast steel bumpers and cross ties and carried on semielliptic springs over the journal driving boxes. Each of the driving axles carries a 410 horsepower, 1,500-volt motor, insulated for 3,000 volts line voltage. The motors are geared directly to the axles with "Nuttall" flexible gears. The remainder of the electrical equipment is of the same type as that on the freight locomotives, the only difference between the two types being the mechanical parts and the motors. Westinghouse air brakes are used, straight air on the locomotives with automatic brakes available for the locomotive and train.

The service of each express passenger locomotive consists of hauling a 300-ton train, made up of 9 to 10 cars, in either direction between Valparaiso and Santiago. On level tangent track the locomotives have a free running speed of 62 miles per hour with 2,700 volts at the trolley when hauling a 300-ton trailing load. On the Tabon grade the average running speed at the same voltage and with

the same load will be 33 miles per hour. The range of speed in regenerative braking is 20 to 50 miles per hour.

The maximum tractive effort is 70,800 pounds, and the maximum speed 63 miles per hour.

EXPRESS PASSENGER LOCOMOTIVES

Total weight of unit.....	259,800 pounds.
Classification of wheels.....	2-6-0+0-6-2.
Weight on drivers.....	210,000 pounds.
Number of driving axles.....	6.
Number of idle truck axles.....	2.
Total weight on idle trucks.....	49,800 pounds.
Capacity at 1-hour rating.....	2,460 horsepower.
Maximum starting tractive effort.....	70,800 pounds.
Tractive effort—hourly rating.....	25,800 pounds.
Speed—hourly rating.....	36 miles per hour.
Tractive effort—continuous rating.....	19,800 pounds.
Speed—continuous rating.....	39.75 miles per hour.
Maximum speed.....	63 miles per hour.
Total wheel base.....	48 feet 4 inches.
Rigid wheel base.....	14 feet 5 inches.
Length over all (between bumpers).....	58 feet 5 inches.
Width over all.....	10 feet 6¾ inches.
Height from rail to locked position of pantagraph.....	14 feet 4⅞ inches.
Diameter of driving wheels.....	42 inches.
Diameter of idle truck wheels.....	30 inches.
Voltage and type of collector.....	3,000 volts direct current, overhead.
Gage.....	5 feet 6 inches.
Number and type of motors.....	6, type 354 A5.
Method of drive.....	Flexible gear.
Gear ratio.....	21:56.
Type of control.....	Electropneumatic (HGFR).
Number of this type of unit in service.....	6.

Electric local passenger-type locomotives.—The 11 local passenger locomotives are of the 0-4-0+0-4-0 type, weighing 160,000 pounds each. There are two 2-axle trucks connected by a "Mallet" hinge. The frames are of Commonwealth steel cast in one piece. Channel and I-beam sections are used wherever possible to obtain lightweight construction. The cab superstructure is of the single-box type. Each of the four driving axles carries a 410-horsepower motor, identical with the motors used by the express passenger locomotives. The motors are geared to the axles with "Nuttall" flexible gears. The control equipment is practically the same as that used on the other types of locomotives with the exception that it does not provide for regeneration. There are two possible speed combinations, the first, with all the motors in series, providing half-speed operation, and the second, with two motors in series and two groups across the line, providing full-speed operation. Aside from being connected for two speed combinations, field control adds two more running notches, making a total of four efficient operating speeds. Each locomotive is equipped for double-end operation, having a master controller located in an operating compartment at each end of the cab.

The traffic requirements call for local passenger trains composed of first, second, and third class coaches operated between Valparaiso and Llai Llai and intermediate points. The loads vary from 260 to 350 tons.

The maximum starting tractive effort is 47,200 pounds and the maximum speed is 56 miles per hour.

LOCAL PASSENGER LOCOMOTIVES

Total weight of unit.....	160,000 pounds.
Classification of wheels.....	0-4-0+0-4-0.
Weight on drivers.....	160,000 pounds.
Number of driving axles.....	4.
Number of idle truck axles.....	0.
Total weight on idle trucks.....	0.
Capacity at 1-hour rating.....	1,640 horsepower.
Maximum starting tractive effort.....	47,200 pounds.
Tractive effort—hourly rating.....	17,200 pounds.
Speed—hourly rating.....	36 miles per hour.
Tractive effort—continuous rating.....	13,200 pounds.
Speed—continuous rating.....	39.75 miles per hour.
Maximum speed.....	56 miles per hour.
Total wheel base.....	26 feet.
Rigid wheel base.....	8 feet 4 inches.
Length over all (between bumpers).....	38 feet 9½ inches.
Width over all.....	10 feet 7 inches.
Height from rail to locked position of pantagraph.....	14 feet 2¾ inches.
Diameter of driving wheels.....	42 inches.
Diameter of idle truck wheels.....	0.
Voltage and type of collector.....	3,000 volts direct current, overhead.
Gage.....	5 feet 6 inches.
Number and type of motors.....	4, type 354-A5.
Method of drive.....	Flexible gear.
Gear ratio.....	21:56.
Type of control.....	Electropneumatic.
Number of this type of unit in service.....	11.

Electric switcher-type locomotives.—Seven electric locomotives are used in switching service. They are of the 0-4-0+0-4-0 swivel-truck type with a steeple cab, and weigh 137,000 pounds. Each of the four driving axles carries a 160-horsepower motor geared to the axle through "Nuttall" solid helical gears. The motors are similar in many respects to those used on the freight locomotives. The control equipment is similar to that used on the other types of locomotives except that it does not provide for regeneration or field control of the motors. There are two speed combinations; the first, for half-speed operation, having all motors in series; and the second, for full-speed operation having two groups of two motors each in series across the line. Each cab is equipped with two master controllers for double-end operation.

The locomotives are used principally in yard switching service and in transfer work between freight yards and terminals.

SWITCHER LOCOMOTIVES

Total weight of unit.....	137,000 pounds.
Classification of wheels.....	0-4-0+0-4-0.
Weight on drivers.....	137,000 pounds.
Number of driving axles.....	4.
Number of idle truck axles.....	0.
Total weight on idle trucks.....	0.
Capacity at 1-hour rating.....	640 horsepower.
Maximum starting tractive effort.....	56,000 pounds.
Tractive effort—hourly rating.....	23,000 pounds.
Speed—hourly rating.....	10.5 miles per hour.
Tractive effort—continuous rating.....	11,000 pounds.
Speed—continuous rating.....	12.75 miles per hour.
Maximum speed.....	35 miles per hour.
Total wheel base.....	27 feet 4 inches.
Rigid wheel base.....	8 feet 6 inches.

Length over all (between bumpers).....	40 feet 0 inch.
Width over all.....	10 feet 6¾ inches.
Height from rail to locked position of pantagraph.	14 feet 2¾ inches.
Diameter of driving wheels.....	42 inches.
Diameter of idle truck wheels.....	0.
Voltage and type of collector.....	3,000 volts direct current, overhead.
Gage.....	5 feet 6 inches.
Number and type of motors.....	4, type 350 D2.
Method of drive.....	Helical gear.
Gear ratio.....	16:63.
Type of control.....	Electropneumatic.
Number of this type of unit in service.....	7.

EMPLOYEES

At the end of the calendar year 1926 the railway had 20,950 employees.

COUPLERS

Both freight and passenger services are being equipped with automatic couplers. The Sharon type coupler is being installed at a height of about 90 centimeters from the top of rails.

MOTIVE POWER AND ROLLING STOCK

The southern section at the end of calendar year 1927 had on hand 618 locomotives, of which number 556 were owned by this system. Of these locomotives 512 were for the 1.676-meter gage, 27 for 1-meter gage, and 17 for 0.60-meter gage track. The remainder, or 62 locomotives, were shown in the company's books as rented, borrowed, or loaned to other lines. Three of the locomotives rented were for 1.67-meter gage, and one for 0.60-meter gage track, the remainder being for 1-meter gage. The system borrowed one 1.67-meter gage and two 0.60-meter gage locomotives, while it loaned to other lines 54 of the 1.67-meter gage and one of the 0.60-meter gage locomotives. Thirty-nine of the above locomotives are electric. The details pertaining to the electric locomotives used only on this system are found under the heading "Traction power." Further details pertaining to the characteristics of the various locomotives used on both northern and southern sections of the central system will be found in Appendix D.

PASSENGER CARS

Classes	1926				1927			
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.68-meter gage	1-meter gage	0.60-meter gage	Total
First class.....	170	13	7	190	168	13	7	188
Second class.....	68	3	—	71	52	3	—	55
Third class.....	183	19	15	217	205	19	15	239
Mixed.....	21	1	4	26	22	1	4	27
Sleeping.....	18	—	—	18	18	—	—	18
Parlor.....	6	—	—	6	6	—	—	6
Dining cars.....	6	—	—	6	6	—	—	6
Funeral cars.....	2	—	—	2	2	—	—	2
Motor rail cars.....	4	—	—	4	4	—	—	4
Total public service.....	478	36	26	540	483	36	26	545
Special cars.....	24	—	—	24	23	—	—	23
Presidential cars.....	2	—	—	2	2	—	—	2
Motor rail cars.....	35	—	2	37	35	—	2	37
Grand total.....	539	36	28	603	543	36	28	607

At the end of the calendar year 1927 the following types of motor rail cars were in operation:

Make	1.676-meter gage		
	Cylinders	Type	Number
Ford.....	4	Touring.....	14
Do.....	4	Freight.....	1
Fordson.....	4	Tower repair.....	1
Dodge.....	4	Touring.....	4
Do.....	4	Closed.....	1
Do.....	4	do.....	1
Do.....	4	do.....	2
White.....	4	do.....	3
Bagueley.....	4	Freight.....	2
Le Roy.....	4	Closed.....	1
Willys.....	6	do.....	1
Local.....	4	do.....	8
Total.....			59
	0.700-meter gage		
	Cylinders	Type	Number
Ford.....	4	Touring.....	1
Fairbanks.....	1	Open.....	1
Total.....			2

The following table shows the number of cars, other than passenger, in the years 1926 and 1927:

	Baggage cars							
	1926				1927			
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.63-meter gage	1-meter gage	0.60-meter gage	Total
Total.....	81	9	6	96	82	9	7	98
	Freight cars in public service							
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.63-meter gage	1-meter gage	0.60-meter gage	Total
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.63-meter gage	1-meter gage	0.60-meter gage	Total
Box cars.....	2,063	42	12	2,117	2,111	47	12	2,170
Cattle cars.....	1,289	47	10	1,346	1,417	44	10	1,471
Flat cars.....	2,058	121	58	2,237	2,070	120	58	2,248
Gondola cars.....	1,414	15	8	1,437	1,424	31	8	1,463
Powder cars.....	34	2		36	34	2		36
Refrigerator cars.....	33			33	31			31
Total.....	6,891	227	88	7,206	7,087	244	83	7,419
	Freight cars for railway work purposes							
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.63-meter gage	1-meter gage	0.60-meter gage	Total
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.63-meter gage	1-meter gage	0.60-meter gage	Total
Total.....	703	51	32	786	833	50	32	915
	Private cars							
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.63-meter gage	1-meter gage	0.60-meter gage	Total
	1.68-meter gage	1-meter gage	0.60-meter gage	Total	1.63-meter gage	1-meter gage	0.60-meter gage	Total
Total.....	887			887	873			873

NORTHERN SECTION

RIGHT-OF-WAY CHARACTERISTICS

This discussion of right-of-way characteristics pertains only to the Red Central Norte, commonly known as the northern section.

Altitude.—The lines of this section run from about 4 meters above sea level to 241.6 meters, which is the highest point on the system.

Gages.—The gage of the system is 1 meter throughout.

Grades.—The maximum up grade is 5 per cent for a distance of 630 meters, while the maximum down grade is 4 per cent for 87 meters. On the rack section the maximum up grade is 6 per cent for a distance of 3,229 meters while the maximum down grade is 6 per cent for a distance of 3,123 meters.

Rack section.—The ABT type of rack system is used. There are two sections in operation. The first section begins at Polquico and ascends 13 kilometers to Quillon, descends 11 kilometers to Tilana, ascends 9 kilometers to Cristales, descends 10 kilometers to Caimanes, ascends 9 kilometers to Los Astas, and then descends to Socavon, a distance of 11 kilometers, aggregating a total length of 63 kilometers. The second section commences at Matancillas and ascends a distance of 13 kilometers to El Espino and then down 6 kilometers to Hermoso, aggregating a total of 19 kilometers. In all there is 82 kilometers of rack line in use.



FIGURE 15.—Locomotive yard at San Bernardo, central system, Chilean State Railways

Curves.—The radius of the minimum curve on the adhesion track is 70 meters, while on the rack line there are curves with radii of 150 and 190 meters, respectively.

Ballast.—The line is well ballasted with crushed stone, about 2 centimeters in circumference, as well as sifted gravel or stones slightly smaller than the crushed stone. The ballast is renewed as occasion demands.

Water.—Water is secured principally from wells, although some is obtained from neighboring streams. There are eight water stations located an average distance of 19.5 kilometers apart with a total capacity of 40,520 hectoliters. Both concrete and iron tanks are used for storage purposes.

Ties.—Wood and steel ties are used. The wood ties are 1.80 by 0.20 by 0.15 meters, spaced 1,500 to the kilometer, while the steel ties are 1.85 by 0.25 by 0.20 meters. Most of the steel ties are used on the rack section.

Fuel.—Coal is used for fuel. There are 28 coal stations located an average distance of 61.3 kilometers apart with a total capacity of 23,720 tons. Both Chilean and American coal is used. (The detailed data under this heading of the right-of-way description pertaining to the southern section of the central system can likewise be applied here.)

Rails.—Steel rails weighing 16 to 40 kilograms, in 6 to 10 meter sections, are used.

Maintenance.—The lines on the system are kept in good condition.

Signaling equipment.—See heading "Signaling equipment" under the southern section. However, there have been fewer modern improvements on this system.

Culverts and small bridges.—There are 3,300 culverts and small bridges aggregating 5,367 meters in length.

Bridges.—There are 105 large bridges aggregating 6,817 meters in length. Seventy-five of these bridges are on the main line and 30 on branches.

Tunnels and galleries.—There are 27 tunnels and galleries, aggregating 9,453 meters in length. Eighteen of these tunnels are on the main line and 9 are on branch lines. Some are of masonry and others are cut out of natural rock.

EMPLOYEES AND EQUIPMENT

Employees.—During the calendar year ended December 31, 1926, the system employed 2,871 men.

Couplers.—Both freight and passenger services are being equipped with automatic couplers. The Sharon type coupler is being installed at a height of about 90 centimeters from the top of rails.

Car-lighting equipment.—For description of car-lighting equipment, see p. 70.

MOTIVE POWER AND ROLLING STOCK

The northern section had 131 locomotives on hand at the end of the calendar year 1927. There were 105 of these locomotives for 1-meter gage track, owned by the system, while one was borrowed from another railway. In addition, the system had loaned 12 locomotives for 1.435-meter gage track and 13 locomotives for 1-meter track. Further details pertaining to the characteristics of the various locomotives used on both northern and southern sections of the central system will be found in Appendix D.

At the end of the calendar years 1926 and 1927 the northern section had on hand the rolling stock shown in the following tables:

PASSENGER CARS

Classes	1926			1927		
	1-meter gage	1.43-meter gage	Total	1-meter gage	1.43-meter gage	Total
First class.....	27	4	31	20	4	33
Second class.....	1	—	1	1	—	1
Third class.....	58	6	34	28	6	34
Mixed.....	29	3	23	17	3	20
Sleeping cars.....	5	—	5	5	—	5
Dining cars.....	5	—	5	5	—	5
Funeral cars.....	1	—	1	1	—	1
Motor rail cars.....	—	—	—	8	—	8
Total public service.....	87	13	100	54	13	107
Special cars.....	5	—	5	6	—	6
Motor rail cars.....	26	—	26	18	—	18
Grand total.....	118	13	131	118	13	131

Details of the 26 motor rail cars for 1-meter gage on hand at the end of the year 1927, mentioned in the foregoing table, are as follows:

Make	Cylinders	Type	Number
Ford.....	4	Touring.....	4
Dodge.....	4	do.....	6
Do.....	4	Closed.....	2
White.....	4	do.....	4
Climax.....	4	do.....	1
Ewan Pratt.....	6	do.....	3
Wisconsin.....	6	do.....	1
Le Roy.....	4	Covered.....	1
Local.....	4	do.....	4

BAGGAGE AND FREIGHT CARS

	Baggage cars					
	1926			1927		
	1-meter gage	1.43- meter gage	Total	1-meter gage	1.43- meter gage	Total
Total.....	18	6	24	15	6	21
Freight cars for public service						
Box cars.....	154	8	162	155	8	163
Cattle cars.....	100	1	101	101	1	102
Flat cars.....	384	13	397	388	13	401
Gondola cars.....	357	78	435	348	78	426
Powder cars.....	4	—	4	4	—	4
Lime cars.....	24	—	24	24	—	24
Refrigerator cars.....	2	—	2	2	—	2
Total.....	1,025	100	1,125	1,022	100	1,122
Freight cars for railway work purposes						
Total.....	86	22	108	72	22	94

REPAIR SHOPS

The central system of the Chilean State Railways has five repair shops located at Baron and San Bernardo in the first zone, Concepcion in the third zone, Valdivia in the fourth zone, all of the southern section, and at Ovalle on the northern section. While minor repairs to locomotives can be made at the Baron, Valdivia, and Concepcion shops, they are generally used for repairs to rolling stock, with the exception of electric locomotives, which are all handled at Baron. While the shops at Ovalle on the northern section are equipped to handle repairs for all types of rolling stock on the northern section, their capacity is small and equipment antiquated, and consequently, major repairs are made at the San Bernardo shops in the first zone of the southern section. There are also a number of roundhouses, the principal ones of which are located at Coquimbo, San Rosendo, Temuco, Talca, and San Eujenio. Early in 1929 the terminal facilities in Valparaiso were to be improved. New construction and the relaying of some of the old lines with new American rails, as well as new car barns, were to be constructed at a cost of approximately 1,340,000 pesos. Purchases for the repair shops are handled through the chief of the department of materials and warehouses at the Estación Alameda, Santiago, and are made through public tenders.

It became apparent as early as 1910 that the repair shops of the State Railways were inadequate to maintain the necessary repairs to the rolling stock of the road. Money for new shops and equipment could not be had until after the passage of the reorganization capital law in 1914, when an appropriation was made for that purpose. Bids were invited for building and equipping a group of shops having capacity for the rapid and economic repairs of 600 locomotives, 483

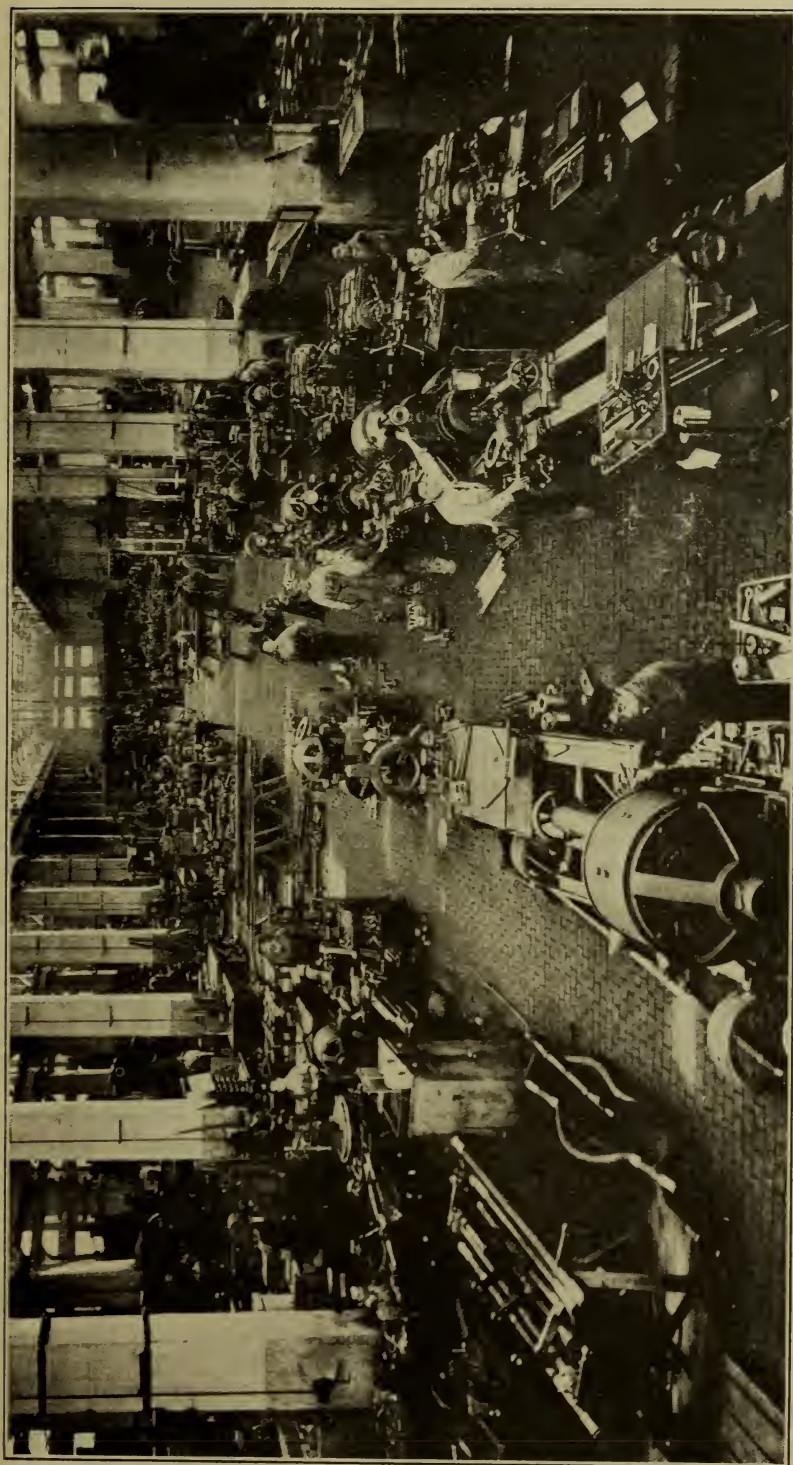


FIGURE 16.—Machine shop at San Bernardo, central system, Chilean State Railways

passenger coaches, and 6,000 freight cars, comprising the total rolling stock of the road at that time.

Prizes were offered for the best plans for the shops and equipment and were competed for by a number of responsible concerns. The first prize was awarded to the Niles-Bement-Pond Co., New York, which submitted a very complete set of plans, accompanied by specifications and estimates worked out by George Henderson, engineer, in collaboration with experts of the General Electric Co., the Niles-Bement-Pond Co., and the United States Steel Corporation in their respective fields of electrical equipment, machine tools, and structural steel for buildings.

The original decision of the State Railways was to carry out the proposal as indicated by the accepted plan. However, on account of the European war and the high price of steel caused thereby, it became necessary to abandon constructing the buildings according to the original plans and to construct them of reinforced concrete according to plans offered by the Compañía Holandesa at the time the bids were opened in July, 1915.

Apart from the difficulties of reinforced concrete construction in a locality having but little available labor trained in that class of work, the change in plan was a good one, as the material used offers reasonable resistance to earthquake shocks that are prevalent.

The first group of buildings to be started were to be used as repair shops for locomotives (six buildings), leaving the passenger and freight car shops to be built at a later date.

A plot of ground of 120 hectares was purchased for about \$5,000, United States gold, in the vicinity of San Bernardo, about 10 miles south of Santiago. Of this ground about 112 acres was for the general shops and 188 acres for the workmen's houses.

The machinery was all obtained from the Niles-Bement-Pond Co., author of the general plan, for \$604,500, and all the equipment was installed under the direct supervision of engineers associated with that organization. On April 15, 1920, the shops were opened for operation.

The location of the shops at San Bernardo was chosen on account of its being the approximate center of traffic of the State Railways. Likewise it was possible here to obtain an excellent plot of ground parallel to the central railway and accessible to both extremities of the line where trains could enter and leave with great facility. The relative nearness of Santiago, which would be the only source of supply in the early part of the work, likewise was a factor in the choice.

The locomotive shop touches the main avenue on the south and is in the center of the group of buildings, the blacksmith shops and foundry being placed so as to deliver their products to it with ease. The pattern shops and the pattern storeroom are alongside the foundry.

Repairs to freight and passenger cars are made outdoors in yards laid out for the purpose. One of the yards where repairs to woodwork are made is located alongside the lumber yard and the dry kiln and carpenter shop. In another yard, close to the car and blacksmith shops, repairs to metal parts are made and wheels are replaced. After repairs are completed the cars are painted in whichever yard they are located.

The shops are large, well ventilated and lighted, and the locomotive shop is of sufficient height to permit traveling cranes to carry material



RAILROAD YARDS AT BARON SANTIAGO CHILE

FIGURE 17

well above any rolling stock that may be on the tracks. The walls are of reinforced concrete 15 centimeters thick and waterproofed with "malthoid." The windows have steel sash, one half of which is fixed and the other half arranged to be opened by mechanical means from the floor.

The locomotive shop has five longitudinal bays and at one end there is a transverse bay. The floor dimensions are 187.9 by 87.2 meters.

The machine shop occupies the three central bays of the locomotive shop. The center bay of the three contains the light machinery and is equipped with two 5-ton traveling cranes. The two bays next to the center contain the heavy machinery, all of which are served with 15-ton traveling cranes. The two outer bays are used for locomotives undergoing repairs and each is equipped with a 120-ton traveling crane. All the machinery is direct-motor driven. The roof is of the saw-tooth construction. The glass faces the south, as in the latitude of the location the sun is always northerly. The sash is steel and, like the sash in the walls, half of it can be opened for ventilation. For artificial lighting, lamps of 400 watts are conveniently distributed. The transverse bay at the end is used for the repair of boilers and tenders and is equipped with a 15-ton traveling crane. The runways for the two 120-ton cranes also extend through this part of the building.

The machine equipment includes all such machines as would be installed in the most modern railroad shops in the United States. In arranging the machines two methods and their respective advantages were thoroughly considered. The first method embraced the placing of all machines of one type in a group, and the second grouping the machines according to the work to be done. While the first method is more economical in the number of machines required to do the work, the second method eliminates long-distance trucking and back trucking and for these reasons it was decided to adopt it.

Locomotives enter the shop at right angles to its length after being turned on one of the turntables so distributed that free access may be had to them from any point in the yard. Once within the shop they can be transferred to any of the pit tracks by the traveling crane. Here the wheels are removed and sent to the machine shop and the engines lowered on to blocking. After the engines are dismantled, their boilers can be taken to the boiler shop by the same crane that delivered them to the pit tracks. The boiler tubes are taken out and carried out side on special cars to the tumbling barrel for cleaning. They are then brought back on the same cars to have the bad parts cut out and new pieces welded on. The boiler-shop equipment comprises punching and shearing machines, bending rolls, machines for welding and "safe ending" flues, all of which are served by a traveling crane.

The foundry is located to the eastward of the locomotive shops and covers an area of 2,789 square meters. The molding floor is served by two 15-ton and two 5-ton traveling cranes and three 1-ton hoists. The runways for the cranes extend beyond the building at both ends, so that the cranes can pick up and deliver material from or to the yards. The yard at one end is used for the storage of castings and that at the other end for flasks. Beyond and near the railroad track sand, coke, and iron are stored.

The foundry was designed to produce 25 tons of castings per day with 35 tons as a possibility. Two cupolas have been provided, one having a melting capacity of 10 to 12 tons per hour, while the capacity of the other is 3 to 5 tons. The small cupola is used when only a small amount of iron is to be melted, and is also intended to be used for melting iron for a Bessemer converter. The charging platform is designed for a load of 2,000 kilograms per square foot, and is equipped with a 2-ton elevator for delivering material for the cupola. Included with the building are the caprenter shops and the cleaning and core rooms.

The pattern shop has a floor space of 667 square meters, and is isolated from other buildings to avoid the danger from fire. The building is divided by a concrete wall into two parts, the small part being used for pattern making and the larger for pattern storage.

The blacksmith shop has a floor area of 3,535 square meters and is located conveniently to the machine shops and the site for the future car shops. It has two bays, one of which contains departments for heavy forgings, spring making, and reworking scrap, while in the other stampings and tool forgings are made. All the furnaces are oil fired and air is supplied by blowers or from an air compressor. Several steam hammers and a 2-ton hoist are included in the equipment.

The storeroom is located in a large 2-story building, each floor being 79.54 by 24.38 meters. Platforms are placed on both sides of the building for unloading freight from the cars. The interior is divided into three bays in the center, in one of which there is a 3-ton traveling crane, operated from the floor. The second floor is served by a 2-ton elevator and a stairway.

Power is transmitted from La Florida (the plant supplying Santiago), the current being alternating current, 12,000 volts, and is converted into 220-volt direct current for operating the machinery by two sets of 500-kilowatt rotary converters. For lighting alternating current is used, the voltage being reduced to 220 by step-down transformers.

In addition there is an electric 14 by 16 inch Ingersoll-Rand air compressor driven by a 3-phase synchronous motor, delivering 1,500 cubic feet of air per minute at a pressure of 85 pounds per square inch. The substation is housed in a 1-story building centrally located so as to shorten the underground transmission lines.

Three toilets and coat rooms, including shower baths, are provided in separate buildings, each 15.54 meters square. The floors are paved with square tiles. As there is no sewer system the waste from each toilet is taken care of by a septic tank and after being acidulated and filtered is drained into absorbent wells.

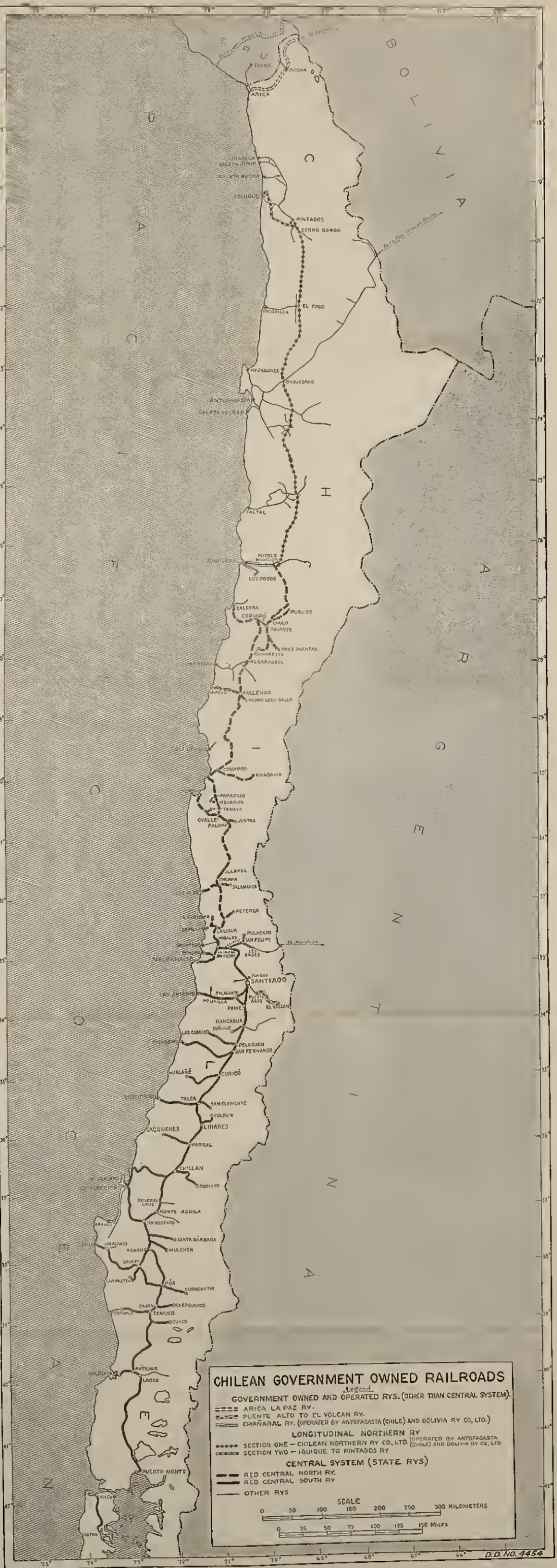


FIGURE 18

GOVERNMENT OPERATED RAILWAYS (OTHER THAN CENTRAL SYSTEM)

In addition to the central system or Chilean State Railways, which were discussed in the preceding section, there are several other railways which are owned, and some of which are operated by the Chilean Government, although they are entirely distinct organizations from that of the central system. These railways are the Arica to La Paz and the Iquique to Pintados Railways, the latter being the second section of the Ferrocarril Longitudinal Norte. Both of these railways are operated directly by the Ministerio de Fomento, Sección Ferrocarriles. There is also the Puente Alto to Volcan Railway, which is operated by the war department of the Chilean Government. The Government also owns the railway from Pueblo Huidido to Pintados, which is operated under the name of the Chilean Northern Railway Co. (Ltd.) and leased by the Government to the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.). This railway is the first section of the Ferrocarril Longitudinal Norte.

In this section each of these railways is discussed in detail with the exception of the Chilean Northern Railway Co. (Ltd.), which is included in the section on the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.).

ARICA-LA PAZ RAILWAY

The Arica-La Paz Railway is one of the outcomes of the "War of the Pacific," which involved Bolivia, Peru, and Chile. In the treaty of peace, amity, and commerce of 1904, the Chilean Government agreed to construct a railway running from Arica to La Paz and to recognize Bolivia's permanent right of way through Chilean territorial ports. Under the second paragraph of article 3 of this treaty the Bolivian section of the railway was to be turned over to Bolivia 15 years after the completion of the railway, which occurred in 1913. This paragraph reads as follows:

The "propiedad" of the Bolivian section of this railway will pass to Bolivia at the expiration of a period of 15 years, to be counted from the day on which it is completely finished.

Tenders were requested by the Government of Chile on August 15, 1905, for the construction of this railway. The one selected was that of the Chilean Public Works Syndicate. Some construction was accomplished in 1906, but it was not until 1909, when Sir John Jackson, an English railroad engineer, took over the contract, that construction of the railway was actually commenced in earnest. He completed the road in 1913 and it has been in operation since May of that year. Difficulties of this construction were great, as a high altitude had to be reached in a short distance, meaning heavier grades and the use of a rack for a considerable distance. All material needed for the start of the Arica-La Paz line at the Bolivian end was imported by way of Peru. In this connection, 120.7 kilometers of pipe line was laid down the Lluta Valley. It is estimated that the entire cost of construction, including the initial purchases of rolling stock, amounted to £4,063,561.

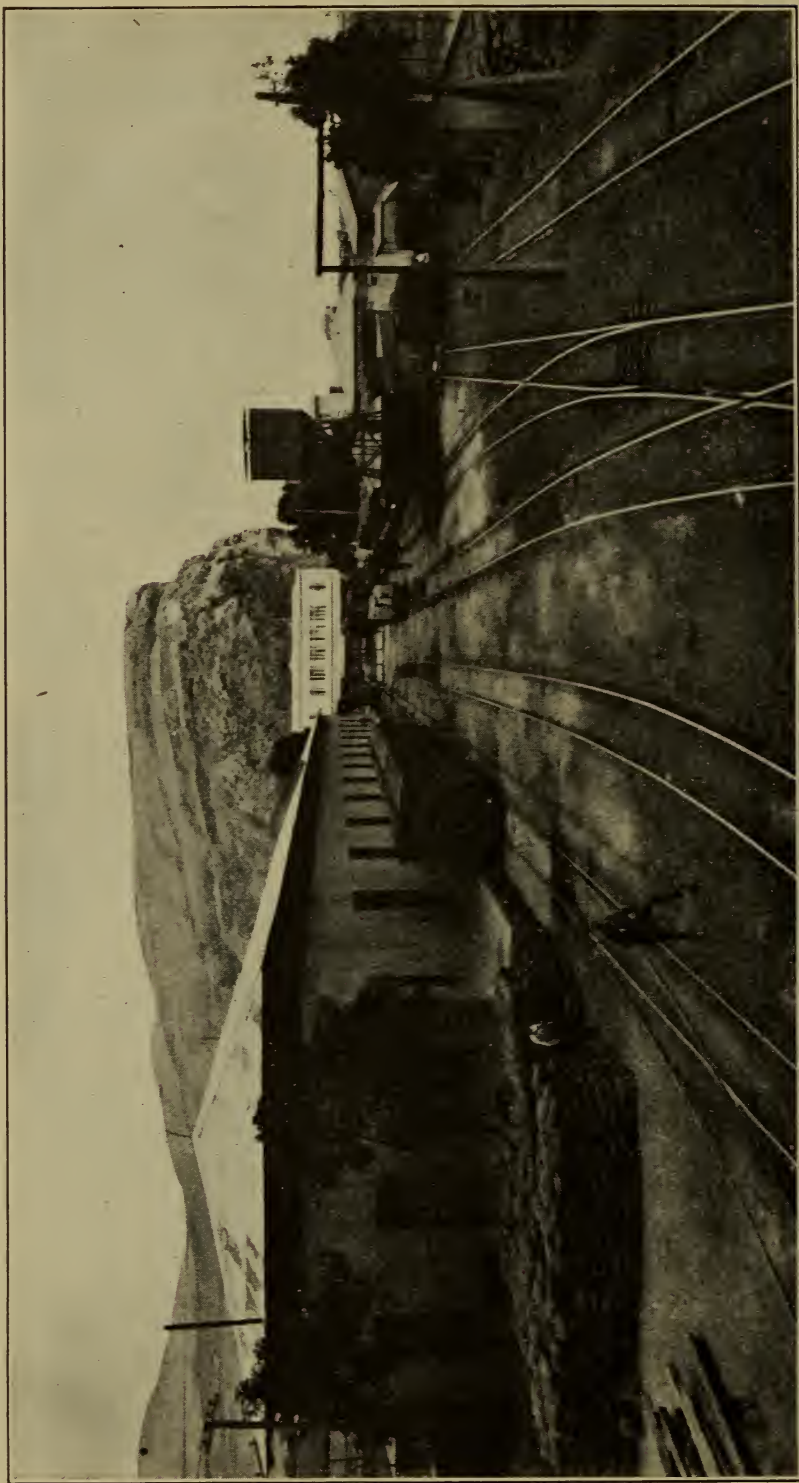


FIGURE 19.—General view of the Arica terminal of the Arica-La Paz Railway from the north. "Morro" rock in the background; freight depot at left; passenger station and platform in center

In 1914 a branch line was constructed, at a cost of 202,395 pesos, from Tarejra to Corocoro, a distance of 8.04 kilometers, by the Bolivian Government, to connect the Corocoro copper mining district with Arica. (Railways of South America, Part II, p. 17, Trade Promotion Series No. 39, Bureau of Foreign and Domestic Commerce.) The railway is owned by the Bolivian Government and now is operated by the First Regiment of Engineers of the Bolivian Army, although formerly it was operated by the Arica-La Paz Railway.

On February 2, 1928, a protocol was signed between representatives of the Bolivian and Chilean Governments. Under its provisions the Bolivian section of this railway was to be turned over to Bolivia in accordance with an inventory of the railway which was provided for in this protocol. A copy of this protocol reads as follows:

Senores Don Conrado Rio Gallardo, Minister of Foreign Affairs, and Don Casto Rojas, envoy extraordinary and minister plenipotentiary of Bolivia, met at the Ministry of Foreign Affairs of Chile to determine the manner in which to comply with the provisions of article 3 of the treaty of October 20, 1904, and the protocol of May 13, 1913, which establish the 13th of May of the year 1928 as the date for the turning over to Bolivia of the Bolivian section of the Arica-La Paz Railway. Having been duly authorized by their respective governments, these men agreed upon the following provisions:

1. The road shall be turned over to the special commission appointed by the Government of Bolivia, after an inventory has been taken of the line, its annexes, yards, and shops, in conformity with article 3 of the treaty of 1904 and article 1 of the protocol of June 27, 1905, pertaining to the construction contract for this railway signed by the Government of Chile and the Sir John Jackson Co. (Ltd.); however, this delivery shall also include the apparatus ordinarily used to repair, maintain, and operate the line, and which material was not used up or consumed prior to the said date, May 13, 1928.

2. For the effects of article 1, the inspector general of Chilean railways and the director general of public works of Bolivia, through a special commission appointed by each party, and the subordinate officials designated, shall take the required prior inventory. The mixed commission so organized shall begin its labors no later than March 1, this year, so that on the following May 13 the inventory shall be finished and the documents referring to the delivery and actual taking possession of the respective section of the railway by Bolivia shall be prepared.

3. A commission consisting of one engineer appointed by each party and all the assistants deemed necessary shall study the technical conditions for the future administration and shall make a report thereof to both nations before March 15 next, so that the latter may, as soon as possible after that date, reach an understanding as to their mutual interests, especially keeping in view the aims referred to in the treaty of 1904; and

4. To study technical conditions for the future administration, simultaneous appointment is made of Don Osvaldo Galecio, on the part of Chile, and Don Jose Aguirre, on the part of Bolivia, who shall preside over the commission referred to in article 3.

In witness whereof, this protocol is signed and sealed, with two copies, at Santiago, on February 2, 1928.

(S.) CONRADO RIOS GALLARDO.
C. ROJAS.

On May 13, 1928, the Government of Chile formally delivered title to the Bolivian Government of that section lying in Bolivia. The division was made at kilometer 206, at a point lying between the General Lagos and Charana stations. The operation of this section was temporarily carried on as in the past.

Under a protocol signed at La Paz on August 29, 1928, the basis on which this railway is to be operated for the next six years, was established. The principal provisions of this protocol are:

1. That the Bolivian section will be operated for the next six years by a newly organized Bolivian corporation as a concession from that Government.

2. That the profits from international traffic are to be shared on a ratio of 40 per cent to the Bolivian and 60 per cent to the Chilean administrations.
3. That freight rates are to be fixed by mutual agreement and are subject to the approval of the two Governments.
4. That the two administrations are authorized to declare special countervailing rates should a rate war be provoked by competing lines.

At the end of the calendar year 1927 the line was 460 kilometers in length, of which 439.5 kilometers were main-line track and 20.5 kilometers branch track. No additional construction work is contemplated in the near future.

OPERATING OFFICIALS

The railway is owned by the Chilean Government, although it is operated independently under the jurisdiction of the Ministry of Fomento, Sección Ferrocarriles, which appoints the director general, whose office is in Arica.

For the year 1927 the personnel consisted of 1,272 employees. Practically all positions are held by natives. The wage scale per day of 8 hours during this period was, for first-class mechanics, \$1.98; mechanics in general, \$1.50 to \$1.98; locomotive engineers, according to class, \$1.87 to \$2.87; and firemen, according to class, \$1.38 to \$1.87 per day. The employees of the railway form the "Sección Arica" of the "Federación Ferroviaria" (Railway Federation), a union of all railway workers of Chile.

The operating officials at the end of 1927 were as follows:

Director general, Osvaldo Galecio.

Chief, traction and shops department, Pedro Michelson.

Chief, transportation department, Manuel Araya.

Chief, materials and warehouses department, Hernan Olivieri.

Chief, maintenance and construction department, M. Rios Fabre.

Chief, accounting department, D. Vanni.

Chief, piers and lighters department, Carlos Enrique.

PURCHASES ¹

The general manager is required to present all requests for purchases to the section of railways of the Ministry of Fomento, at Santiago. Purchases are then made through a purchasing agent, usually by public tender, but in instances where they are for less than 5,000 pesos the local manager may purchase without public tender. All awards must receive the approval of the Ministry of Fomento and are published in the official bulletin of the Government. The purchasing agent is C. Schneider, who should be addressed in care of the railway at Estacion, Alameda, Santiago.

FINANCES ²

This railway has not been granted financial autonomy. Its budget of receipts and expenditures have to be approved by Congress and bear the signature of the President. Profits or losses revert to the Government. Until the reorganization of the line the railroad for some years had been showing a considerable operating deficit. In 1921 the railway was entirely reorganized, and the first effects appeared in 1922, when a small profit was shown. Since that time it has annually shown a surplus.

¹ For general bases for purchase of equipment (1930) see Appendix H.

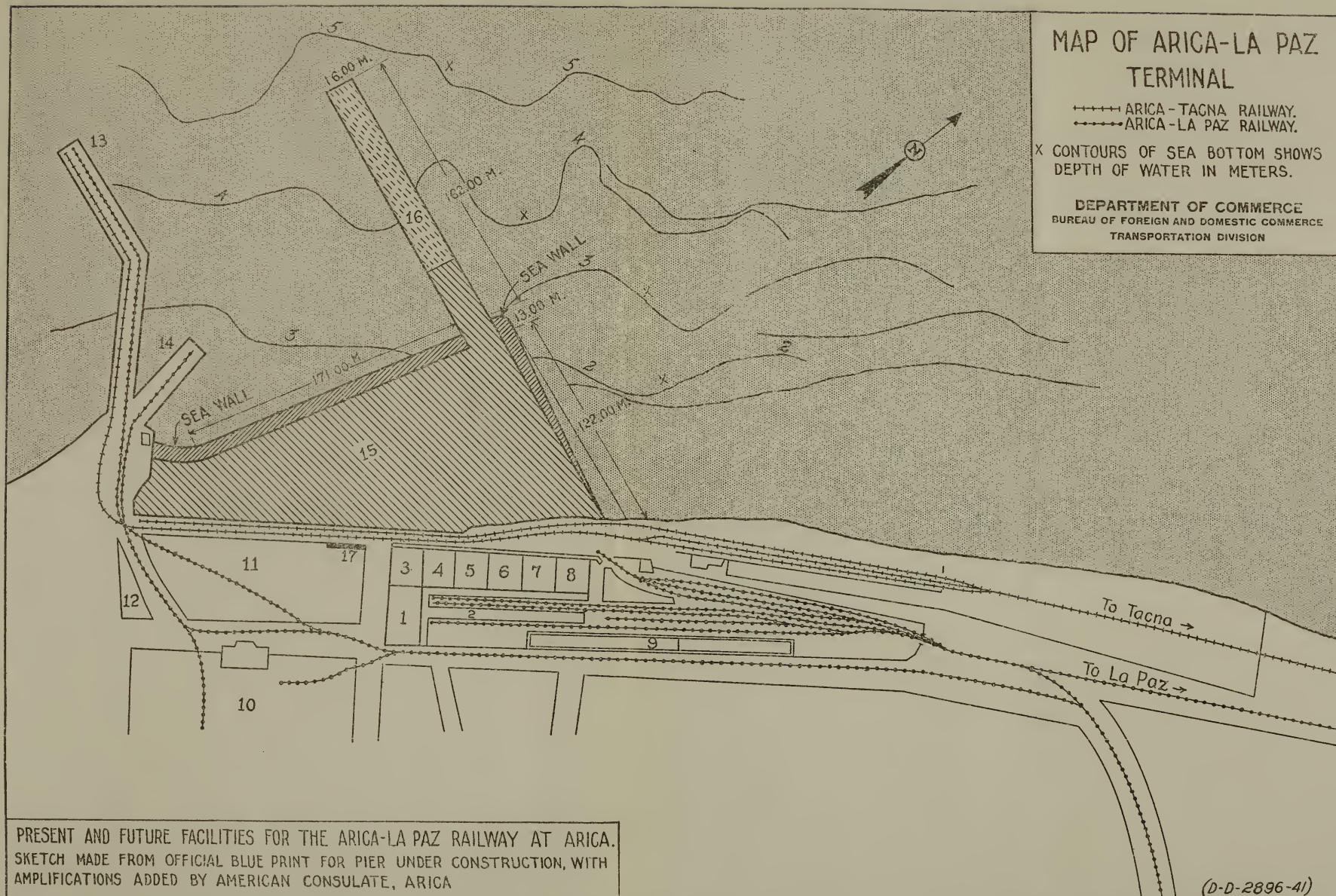
² Estadística de los Ferrocarriles de Chile en Explotación.

MAP OF ARICA-LA PAZ TERMINAL

+++++ ARICA-TACNA RAILWAY.
 ARICA-LA PAZ RAILWAY.

X CONTOURS OF SEA BOTTOM SHOWS
 DEPTH OF WATER IN METERS.

DEPARTMENT OF COMMERCE
 BUREAU OF FOREIGN AND DOMESTIC COMMERCE
 TRANSPORTATION DIVISION



PRESENT AND FUTURE FACILITIES FOR THE ARICA-LA PAZ RAILWAY AT ARICA.
 SKETCH MADE FROM OFFICIAL BLUE PRINT FOR PIER UNDER CONSTRUCTION, WITH
 AMPLIFICATIONS ADDED BY AMERICAN CONSULATE, ARICA

(D-D-2896-41)

- 1 STATION ARICA-LA PAZ RAILWAY.
- 2 COVERED PASSENGER PLATFORM.
- 3-8 RESIDENCES - CHIEF RAILWAY OFFICIALS.
- 9 WAREHOUSE

- 10 CUSTOM HOUSE AND WAREHOUSES.
- 11-12 OPEN ENCLOSED YARDS FOR FREIGHT (CUSTOMS)
- 13 PRESENT PIER - OVERSEA - FREIGHT.
- 14 PRESENT PIER - COASTWISE - FREIGHT.

- 15 TRIANGULAR BASE FOR NEW PIER.
- 16 NEW PIER IN CONSTRUCTION. (LINE SHADING DENOTES WORK COMPLETED; BROKEN SHADING, NOT COMPLETED).
- 17 ARICA-TACNA RAILWAY STATION.

FIGURE 20

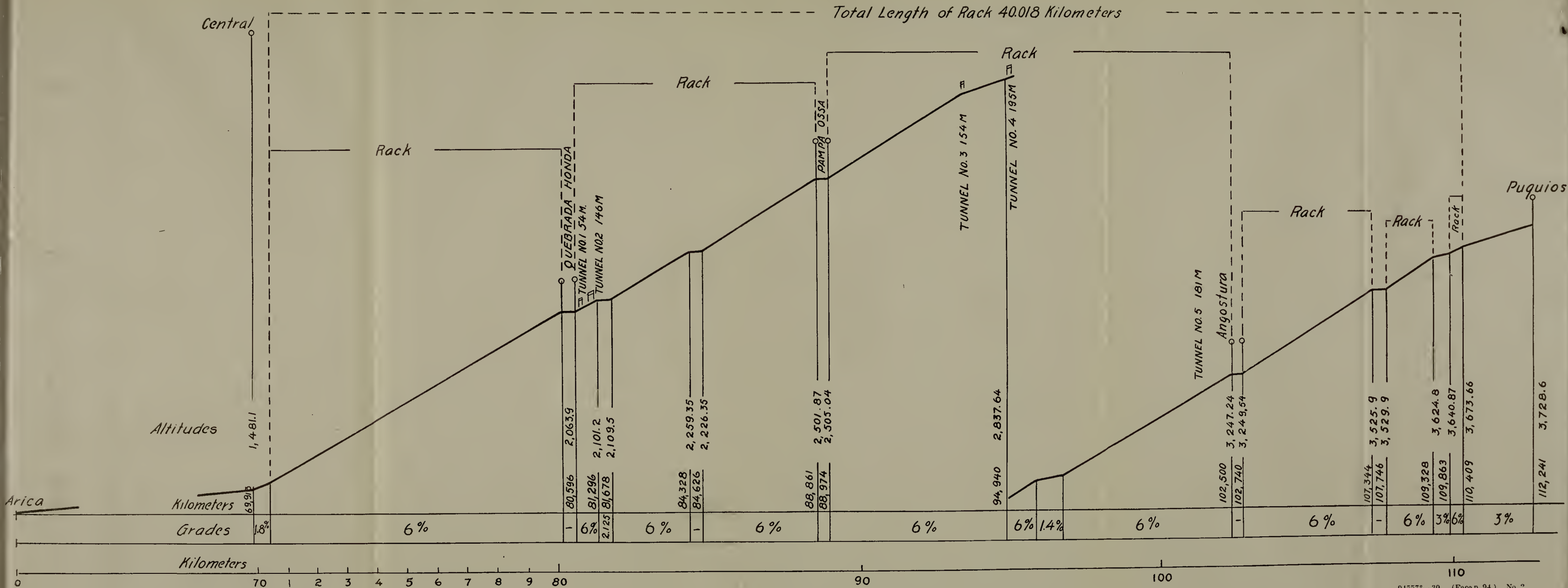


FIGURE 21

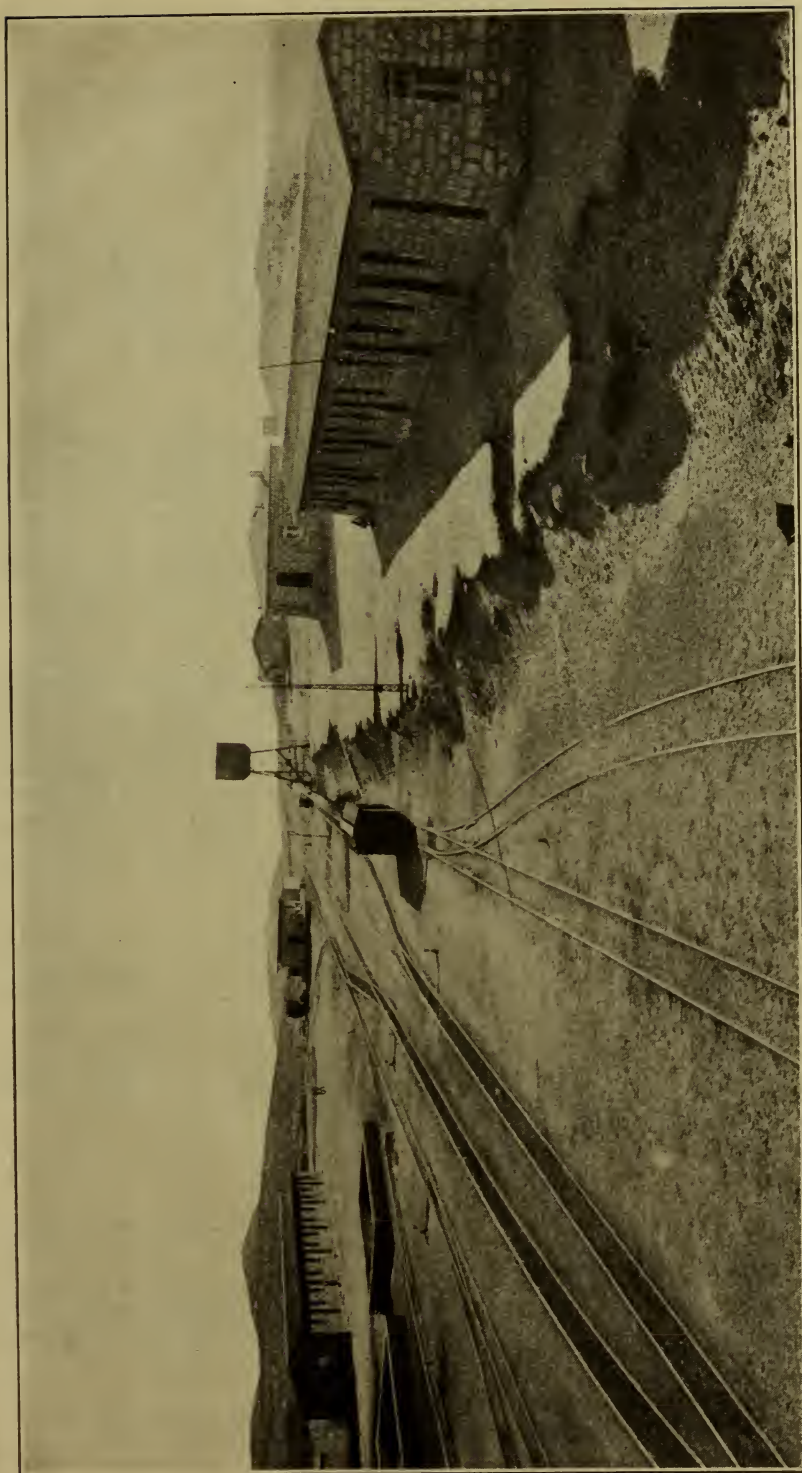


FIGURE 22.—Terminal of rack section, Arica La Paz Railway

The following table indicates the revenues and expenses of the company for the calendar years 1918 to 1927, inclusive:

Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918-----	8,996,034	9,260,643	-----	264,609
1919-----	8,199,624	8,412,495	-----	212,871
1920-----	10,475,325	11,683,272	-----	1,207,947
1921-----	8,866,635	10,598,331	-----	1,731,696
1922-----	10,053,705	9,609,153	444,552	-----
1923-----	12,292,944	9,118,698	3,174,246	-----
1924-----	14,793,066	9,673,797	5,119,269	-----
1925-----	16,034,520	12,342,098	3,692,422	-----
1926-----	14,661,472	13,245,214	1,416,288	-----
1927-----	16,969,664	13,920,313	3,049,350	-----

TRAFFIC ¹

During the last few years this line has steadily increased in importance as a freight carrier, although increased passenger traffic has not followed. The principal commodities carried are minerals and ores, representing about 15 to 18 per cent of the total traffic; cereals, including flour, about 14 per cent; livestock and livestock products, 4 per cent; and sugar, 5 per cent. The traffic from La Paz to the coast is mostly composed of minerals, while that going inland is principally manufactured goods and foodstuffs.

Weekly passenger express service is maintained from the port of Arica to La Paz and vice versa, trains leaving Arica on Mondays at 6.30 p. m. arriving at La Paz on Tuesdays at 2.45 p. m., and leaving La Paz on Thursdays at 4 p. m. arriving at Arica on Fridays at 9.15 a. m. The present first-class fare is 84.10 Chilean pesos and second-class fare, 52.70 pesos. The Pullman fare is 18.40 pesos. Each week there is also one up and one down mixed train; this is a rapid freight with a day coach attached.

The following table indicates the traffic handled by the railway for the calendar years 1918 to 1927, inclusive:

Year	Pas- sengers carried	Freight carried	Year	Pas- sengers carried	Freight carried	Year	Pas- sengers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1918-----	29,802	114,828	1922-----	26,615	113,206	1926-----	24,892	136,057
1919-----	29,140	104,162	1923-----	24,223	126,677	1927-----	20,794	137,752
1920-----	26,520	116,479	1924-----	25,680	143,232			
1921-----	25,613	111,776	1925-----	29,774	153,264			

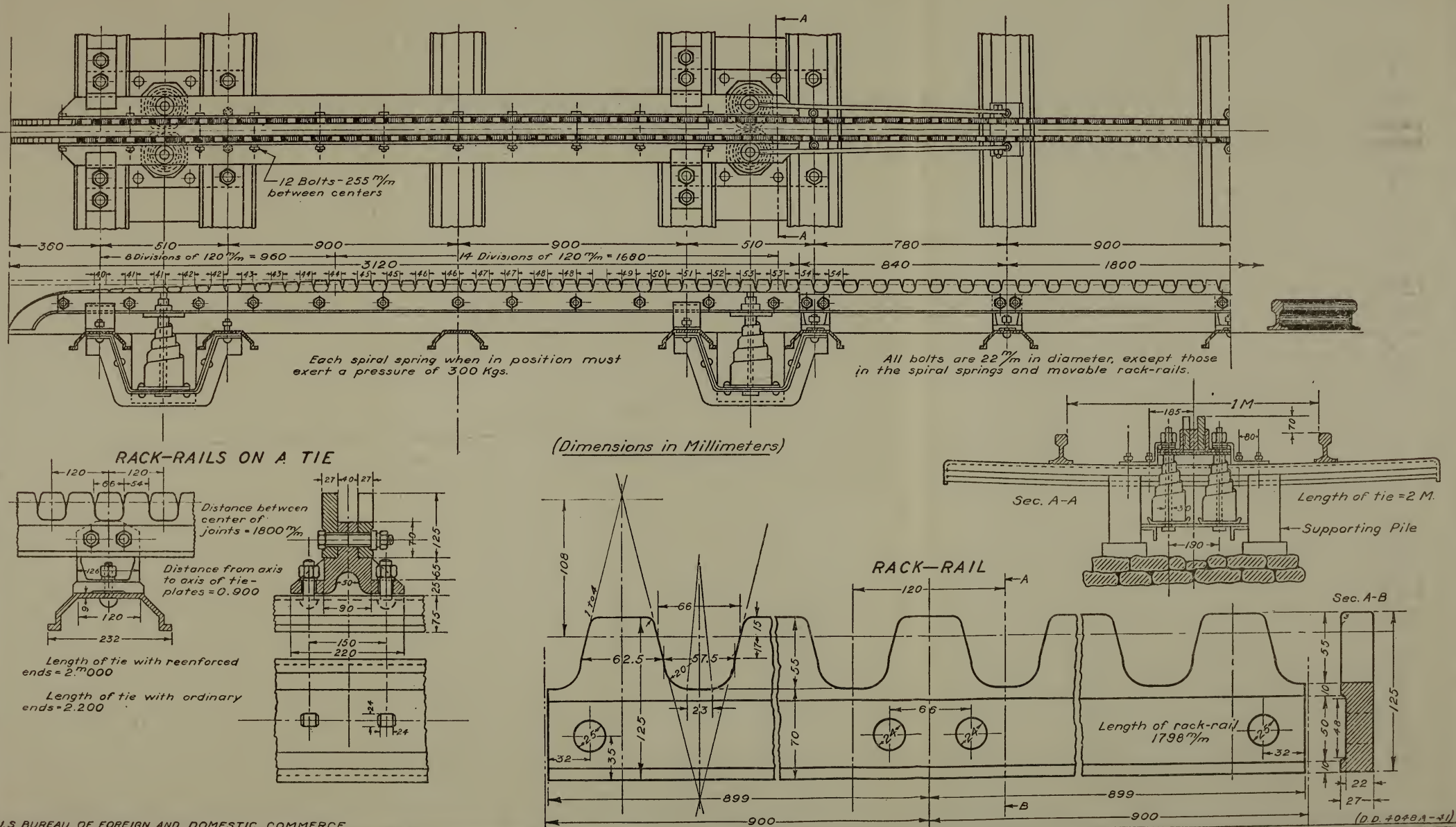
RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The railway runs from Arica, about 3 meters above sea level, to General Lagos, which is the highest point on the line at 4,256 meters, and from this point to La Paz, which is 3,701 meters.

Grades.—The general grade of the line is 3 per cent, although for a distance of 40 kilometers there is a grade of 6 per cent, which necessitates the use of an ABT double-rack system. The following table shows the variance in grades and altitudes between stations:

¹ Estadística de los Ferrocarriles de Chile en Explotación.

LOCKER-RACK A.B.T. SYSTEM



Stations	Altitude	Average per cent of grade	Rise between stations	Rack or plain rail
	<i>Meters</i>		<i>Meters</i>	
Arica to Central.....	3-1,481			
Central to Quebrada Honda.....	1,481-2,064	6	583	Rack.
Quebrada Honda to Pampa Ossa.....	2,064-2,503	6	439	Do.
Pampa Ossa to Angostura.....	2,503-3,228	6	725	Do.
Angostura to Puquios.....	3,228-3,728	6	500	Do.
Puquios to C. Alcerreca.....	3,728-3,917	3	189	Plain.
C. Alcerreca to Humapalca.....	3,917-4,083	3-0	66	Do.
Humapalca to General Lagos.....	4,083-4,256	3-6	173	Do.
General Lagos to La Paz.....	4,256-3,761	0-3	555	Do.

Racks.—As can be seen from the above table, in order to overcome an ascent of 6 per cent, it was necessary to install a third rail or "rack." Altogether 40.01 kilometers, divided into eight sections, are thus equipped between the stations of Central and Puquios. The radius of the maximum curve on this section is 100 meters. At Central, rack locomotives are substituted for the regular engines, and at Puquios, the final station of the rack, the regular engines are again attached.

Gage.—The gage of the road is 1 meter.

Curves.—The radius of the maximum curve on the adherence section is 90 meters.

Ballast.—Earth and crushed stone are used for ballast.

Ties.—On the "rack" system steel ties, 2.08 by 0.30 by 0.10 meters, are used. These ties are spaced 1,200 to a kilometer. On the adhesive section the ties are made of Chilean oak (roble pellin). These ties are 1.80 by 0.20 by 0.125 meters and are spaced 1,500 to a kilometer.

Rails.—Steel rails of English make ("Riel"), 10 meters in length and weighing 27.5 and 30.3 kilos, are used.

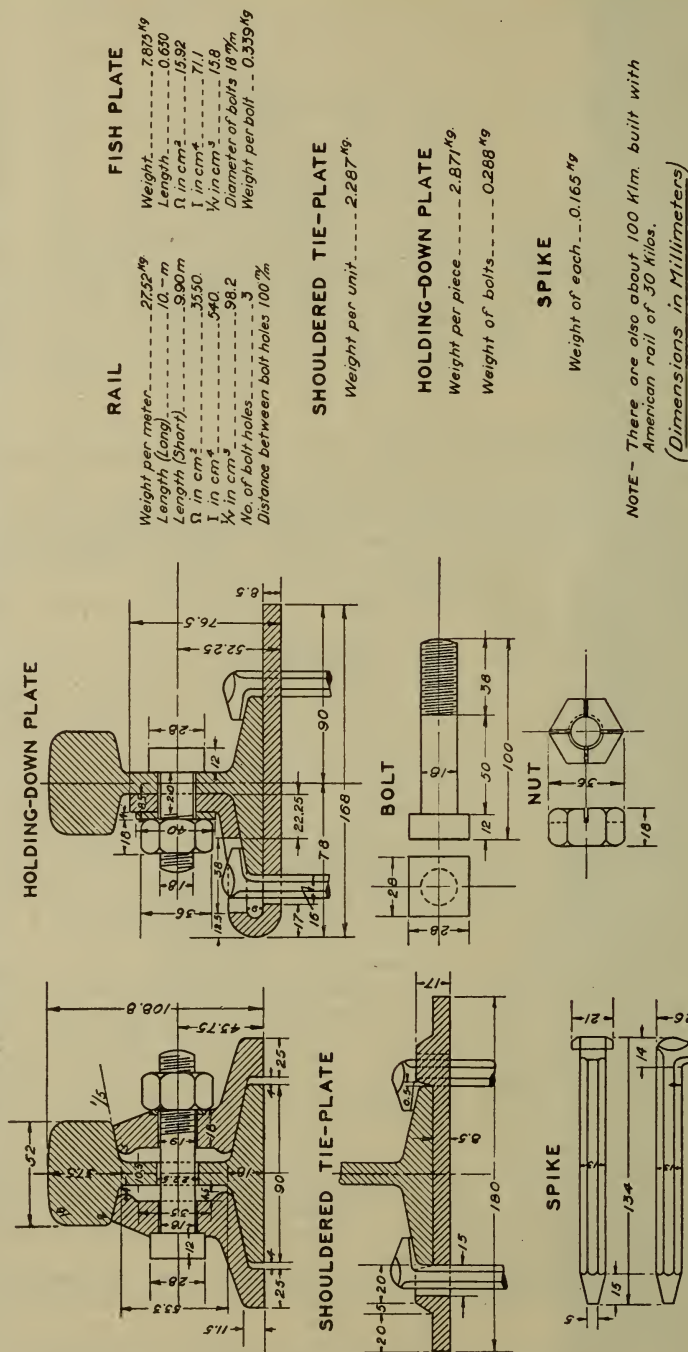
Water.—Water is obtained from the River Caracarani. A reservoir was formed by damming the river, 39 kilometers from the station of Humapalca. From this dam water is conducted, in 5-inch iron pipes, a distance of 39,778 meters to the railway line which it reaches at a point 150 kilometers from Arica. The pipe for the most part runs alongside of the roadbed except in certain instances, where it cuts across the country. In some instances it lies either on the surface or is only covered by a foot or two of soil. The ends of the sections are jointed by flat flanges which are secured by seven heavy bolts and nuts. Lead or fiber washers are laid between the flanges. This river furnishes 700 cubic meters of water a day. The general reservoir is located just north of Arica, it is of concrete construction, and has a capacity of 90,000 gallons. Each station has a water tank and facilities for supplying locomotives with water. There are 26 water tanks, an average distance apart of 16.9 kilometers and having a capacity of 10,530 hectoliters.

Fuel.—Coal is used for fuel. Formerly the railway used mostly Pochontas and Australian coal. However, the continued low rate of exchange of Chilean currency and the desire to assist the national mining industry caused the Ministerio de Ferrocarriles to purchase greater quantities of the native product. During the past two years the coal consumed by the Arica-La Paz Railway was exclusively Chilean. Coal supplies are kept at Arica and at points most practical for replenishment. There are six coal stations, an average distance apart of 73 kilometers, and having a capacity of 5,000 tons. There are no plans for electrifying this line in the near future.

Signaling equipment.—The old type of block system is used for signaling. Trains are operated by the Morse inker telegraphic instrument, usually three to four stations on one circuit parallel. All train-control messages are taken on the tape for the purpose of recording movements. All stations between the terminals are connected by telephone.

Clearance and maximum carriage weights.—The clearance of the road is limited to 4.20 meters in height and 3 meters in width. The average weight carried by

RAIL AND SYSTEM OF LAYING RAILS ON THE RAILWAY FROM ARICA TO LA PAZ



U.S. BUREAU OF FOREIGN AND DOMESTIC COMMERCE — D.D. #042-41

FIGURE 25

freight trains is 20 metric tons. The following table indicates the number of cars and possible weights that may be carried over the various grades of the road:

Stations	Number of cars	Metric tons	Remarks
Arica to Rosario.....	20	280	Rack 6 per cent; rack engines. Engines are changed when size of train is changed.
Rosario to Central.....	8-10	160-200	
Central to Puquios.....	4	80	
Puquios to Charana.....	8	160	
Charana to La Paz.....	8	160	

Maintenance.—The roadbed is well maintained and the line is able to carry all traffic required.

Bridges.—There are 7 bridges on the Chilean section and 39 bridges on the Bolivian section of the road. On both sections there are 1,522 culverts and small bridges having a total length of 1,346 meters.

Tunnels.—There are five tunnels on the road, as follows:

No. 1, length, 54 meters; altitude, 2,063 meters.

No. 2, length, 146 meters; altitude, 2,101 meters.

No. 3, length, 154 meters; altitude, 2,600 meters.

No. 4, length, 195 meters; altitude, 2,837 meters.

No. 5, length, 181 meters; altitude, 3,000 meters.

These tunnels are cut through rock, laid on a curve, and located between Central and Puquies, in the rack rail section.

MOTIVE POWER AND ROLLING STOCK

The motive power and rolling stock owned and operated by the railway at the end of the calendar year 1927 is as follows:

Forty locomotives, of which 34 were in active service. Six of these were yard locomotives, 8 rack locomotives, and 26 adhesion locomotives.

Eight first-class passenger coaches, 4 second-class passenger coaches, 3 mixed passenger coaches, 2 diners, 5 sleepers, 2 special cars, and 4 baggage cars—totaling 28 passenger cars.

The equipment in freight service was as shown in the following table:

	Number	Axles	Cargo capacity	Tare
Box cars:				
American.....	21	4	25,000	10,500
American.....	93	4	25,000	12,900
Belgian.....	33	4	25,000	12,900
German.....	47	4	25,000	13,900
British.....	21	4	25,000	11,500
Belgian.....	24	4	20,000	10,350
Stock cars: American.....	14	4	25,000	12,200
Flat cars: British.....	82	4	25,000	9,200
Petroleum tanks: British.....	6		14,810	
Railway servicing.....	4		7,500	
Total.....	345			

In addition, there were in service two Belgian flat cars (25 tons) and seven Belgian box cars (20 tons) rented from the Northern Longitudinal Railway. There were 23 cars out of service during the year and 25 new wooden box cars were delivered, although they were not placed in operation.

As new passenger equipment is purchased, the all-steel car construction design is given preference and now all first-class passenger

cars are of steel construction. New orders for freight and stock cars require steel underframes, while box cars are of both steel and wooden bodies.

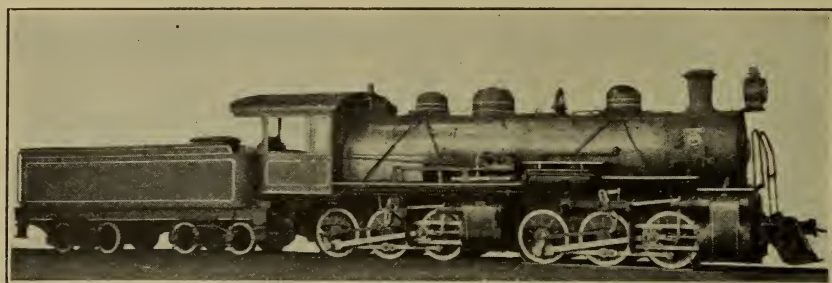


FIGURE 26

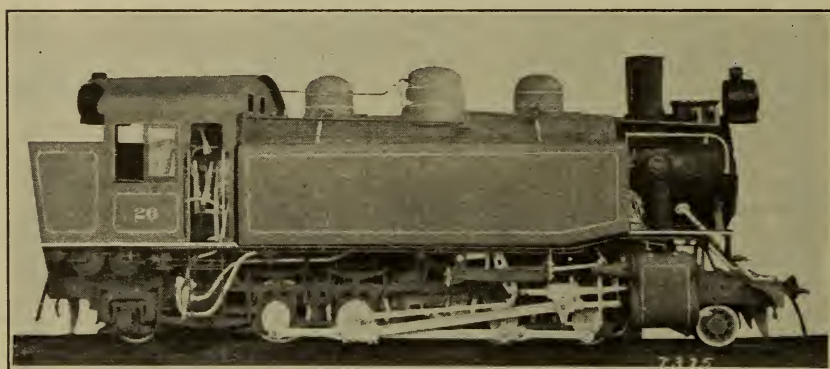


FIGURE 27

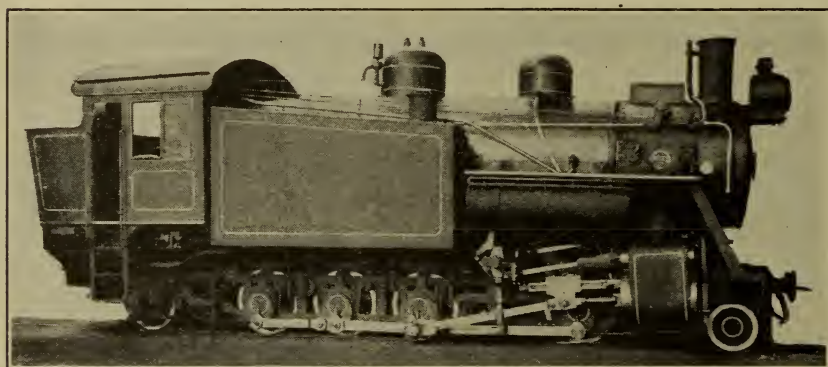


FIGURE 28

Types of locomotives used on the Arica-La Paz Railway

Couplers and brakes.—The older freight cars in use have the link-and-pin couplers, but the newer locomotives and cars are equipped with standard M. C. B. couplers. The draft gear used is the “Butler special tandem spring draft gear.” All cars are supplied with air brakes.

REPAIR SHOPS

The principal repair shops for the railway are located at Chinchorro, which is about 2 kilometers north of the Arica station. Small workshops are located at Central and Puquios for the rack section and at Viacha, Bolivia, for the La Paz end of the line.

The workshops at Chinchorro are equipped to rebuild and repair locomotives, passenger cars, and freight cars. They consist of machine, carpenter, patternmaking, car, smithy, brazing, foundry, upholstery, paint, brass foundry, copper smithy, plumbers, and Roman balance shops.

There is also an electric light plant which is equipped with two Diesel engines each of 500 volts, 270 amperes, and 183 horsepower. An additional freight yard is provided where Bolivian ores waiting for oversea transportation are stored. Likewise a roundhouse and station yard for all locomotives and passenger and freight cars not actually in use.

The following is a list of the principal tools used in each of these shops:

Machine shop.—One double car-wheel lathe; one 25-centimeter lathe; two 20-centimeter screw-cutting lathes; one 15-centimeter screw-cutting lathe; one 18-centimeter screw-cutting lathe; one boring machine; one planing machine, 240 by 90 by 90 centimeters; one 40-centimeter engine lathe; one pipe cutting and threading machine for 5-centimeter bolts and 75-centimeter pipes; one vertical shaper with 30-centimeter throw; one small thread cutter for 9 to 25 millimeters; one 137-centimeter radial boring machine; one vertical boring machine; one sharpener for twist drills; one grindstone and frame; one hack saw; transmission machinery; one 10-ton portable crane; six presses; presses for car and locomotive wheels; tube expanders; dressing plates; standards, couplings; screw plates and screw dies; jack; ratchet braces; wrenches; hammers, and small tools too numerous to mention.

Carpenter shop.—One 122-centimeter circular saw with bench and its saws; hand carts for wood; one endless saw; one planing machine; one shaper; one machine for making pins; one machine for mortising and drilling; driving shafts and transmission belts; one 25-centimeter lathe for rough-dressing; one grindstone; two hoists; small tools; clamps; standards; saw sharpeners, etc.

Smithy shop.—Four forges, 120 by 120 by 180 centimeters; one 500-kilogram steam drop hammer; four anvils and their mounting blocks; four swage blocks; one hoist; ventilating machinery; four sets of tools and four heavy presses.

Brazing shop.—One pair rollers for a piece 180 centimeters wide and 19 millimeters thick; one mural boring machine with radius of 150 centimeters; one 19-millimeter punch; one metal-sawing machine; four forges and blowers of 66 centimeters for rivets; driving shafts and pulleys; transmission belts; standards; tools, etc.

Foundry.—One bell hood; one large hand ladle; two small hand ladles; one 1-ton hoist; Root ventilator for the bell hood and tubes; sieves; cases; tools, etc.

Upholstery shop.—The necessary tools.

Paint shop.—The necessary tools.

Brass foundry.—Crucibles, tongs, hand ladles, tools, sieves, etc.

Copper smithy and plumbers' shop.—Forges, presses for pipes, foot presses, soldering pipes, tools, anvils and their mounting blocks, etc.

Roman balances.—One 20-ton Roman balance for cars; one 5-ton Roman balance for cars; one 5-ton weighing derrick; two platform scales of $\frac{1}{2}$ ton; one $\frac{1}{4}$ -ton platform scale; one 100-horsepower steam engine for the shops; two boilers; one feed pump; one locomotive turntable; pipes, valves, etc.

The workshops at Viacha consist of the following shops: Machine, carpenter, patternmaking, car, smithy, and Roman balances. The following is a list of the principal machine tools used in these shops:

Machine shop.—One double car-wheel lathe; one horizontal boring machine; one 20-centimeter lathe; one vertical shaper; one bolt-threading and cutting machine for 5-centimeter bolts; one vertical drill; one grindstone and frame;

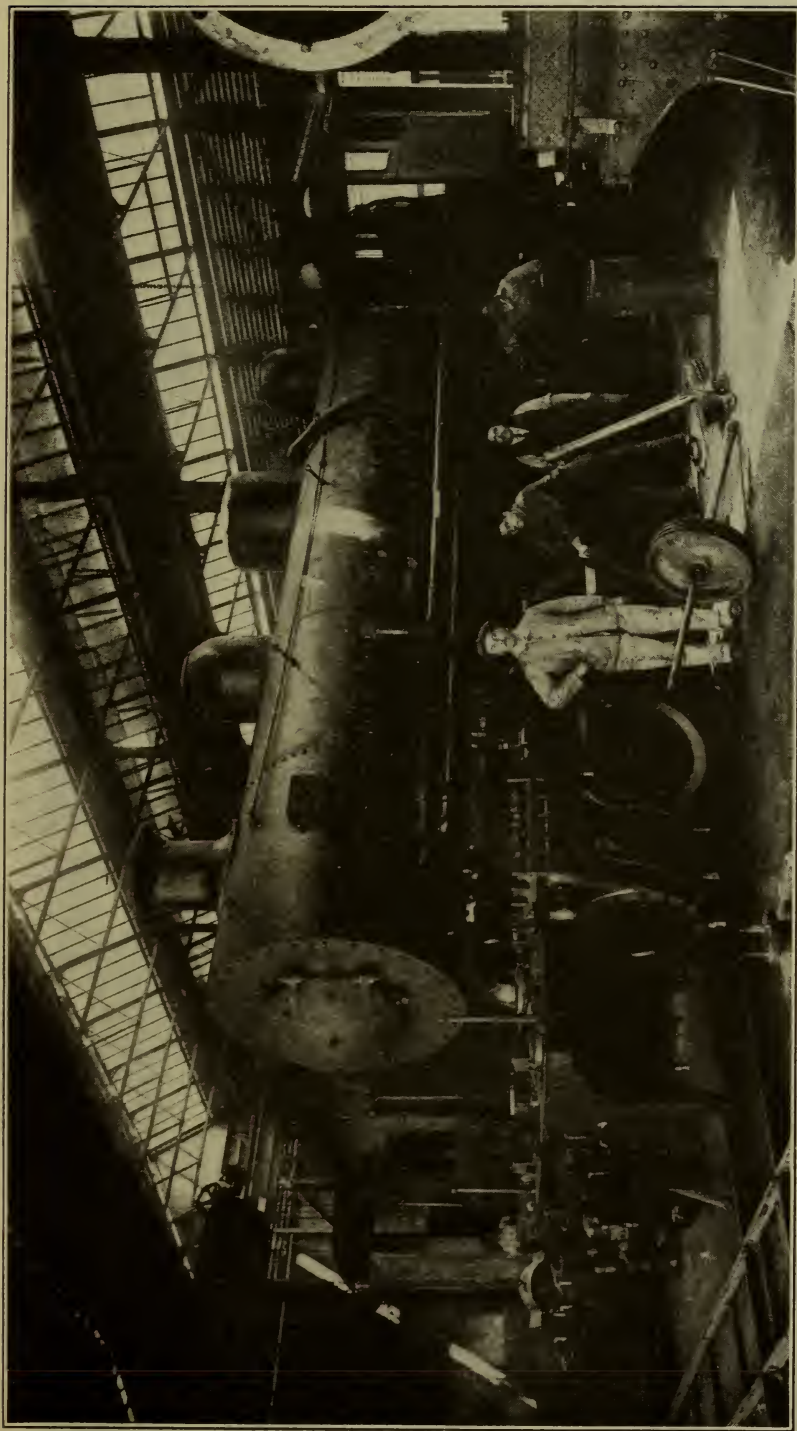


FIGURE 30.—Chinchorro locomotive repair shops of Arica-La Paz Railway

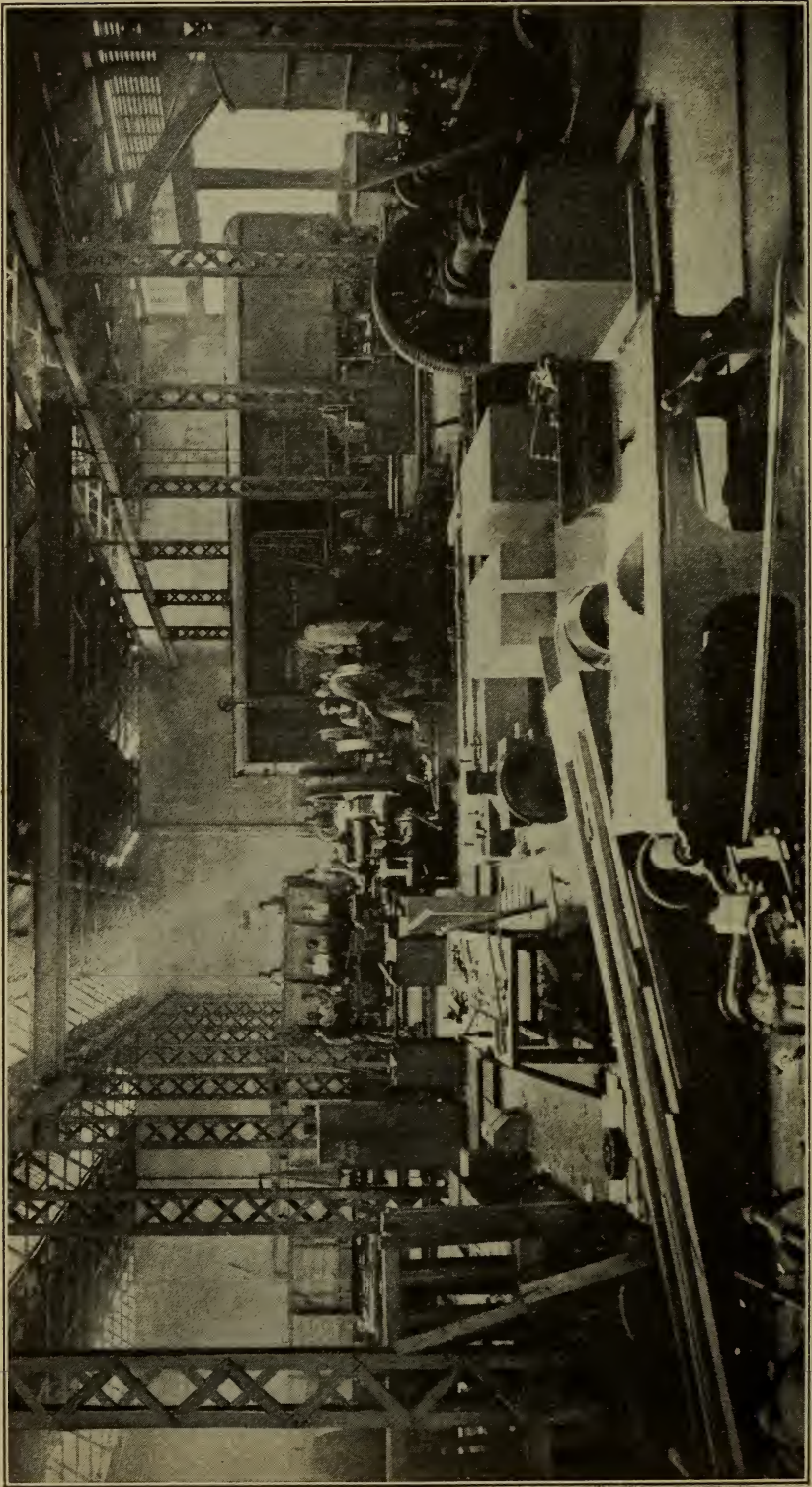


FIGURE 31.—Chinchorro car repair shops of Arica-La Paz Railway

three presses; one hack saw; transmission machinery; one portable 10-ton crane; and small tools too numerous to mention.

Carpenter, patternmaking, and car-repair shops.—One 1.22-centimeter circular saw with bench and saws; handcarts for wood; one endless saw; one planing machine; one shaper; one machine for making pins; one machine for mortising and drilling; saw sharpeners; one 25-centimeter lathe for rough dressing; grindstones for tools; transmission machinery; tools; clamps, etc.

Smithy shop.—Three forges, 120 by 120 by 180 centimeters; one steam drop hammer, 500 kilograms; four anvils and their mounting blocks; four swage blocks; hoist; blowers and ventilators; three heavy presses; and tools.

Roman balances.—One 20-ton Roman balance for cars; one 5-ton Roman balance for cars; one 5-ton weighing derrick; two $\frac{1}{2}$ -ton platform scales; one $\frac{1}{4}$ -ton platform scales; one 75-horsepower steam engine for the shops; two boilers; one feed pump; one locomotive turntable; four gages for ascertaining load of open freight cars; two 15-ton traveling cranes; two 5-ton portable cranes; hanging scaffolds; hydraulic columns; pipes; valves, etc.

The workshops at Puquios have the following machine tools in operation:

One 25-horsepower crude oil motor; one centering lathe, 0.230 by 2.400 by 0.410 meters; one centering lathe, 0.375 by 5 by 0.900 meters; one small blacksmith's lathe; one thread cutter, 0.170 by 0.300 by 0.305 meters; one planing machine, 0.400 meters between verticals and 0.300 meters high; one planing machine, 0.600 meters between vertical and 0.700 meters high; one vertical drilling machine, radius 0.900 meters; one vertical drilling machine, radius 0.500 meters; one pair rolls for plate bending; one machine punch, 0.030 meters; four blacksmith's forges; ventilating machinery; grinding machine; one grindstone; hand punches; assorted ratchet braces; pipe cocks; wrenches; steel hammers, $2\frac{1}{2}$ to 3 pounds; steel cask stands, 6 to 8 pounds; tongs and swages.

The shops at Central have the following machine tools in operation: One 25-horsepower crude oil motor; one 0.304-meter planing machine; one 0.228-meter screw-cutting lathe; one 0.330-meter drill; one punch, 19 by 19 by 19 by 0.554 millimeters; forges 120 by 120 by 180 centimeters; ventilating machinery; one metal-sawing machine; one steam-forging machine, 6.3 by 38 millimeters; special forge for tubes; portable forges; anvils with mounting block; grinding machine with frame, 76 by 152 millimeters; 10-ton hanging scaffolds; 15-ton hanging scaffolds; 20-ton hanging scaffolds; tube expanders, 31-46 millimeters; assorted ratchet braces; pipe cocks; wrenches; steel hammers, $2\frac{1}{2}$ to 3 pounds; steel cask stands, 6 to 8 pounds; 24 pairs of tongs; 24 pairs of swages; and coppersmith's tools.

FERROCARRIL PUENTE ALTO AL VOLCAN

The Puente Alto al Volcan Railway, which is located in the Province of Santiago, is operated by the army for strategic purposes. At the end of the calendar year 1927 it had 66.5 kilometers of track in operation. Of this amount 61.9 kilometers represented main-line track and 4.6 branch track. It connects the parts of the valleys of the Maipo and Volcan Rivers, which are strategic entrances to the Andean passes.

On various occasions it has been rumored that this railway was to be sold to the "Chilena de Electricidad" of Santiago, which has a hydroelectric power plant near Volcan, one of the termini of the railway.

OPERATING OFFICIALS

The railway is operated by the war department, and all purchases are made direct by that organization. It is stated that in recent years practically no purchases have been made. Communications regarding this railway should be addressed to Bartolome Blanche, Ministerio de Guerra, Santiago, Chile.

FINANCES¹

At the end of the calendar year 1927 the capitalization was 8,778,648 pesos. The following table indicates the operating revenues, operating expenses, and gain or loss for the calendar years 1918 to 1927, inclusive:

Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918	478,566	475,521	3,045	
1919	416,034	344,844	71,190	
1920	538,689	437,808	100,881	
1921	429,594	399,819	29,775	
1922	338,355	352,890		14,535
1923	377,526	323,991	53,535	
1924	397,602	286,368	111,234	
1925	401,746	487,499		85,753
1926	927,956	685,212	242,744	
1927	1,083,183	836,885	246,297	

TRAFFIC¹

The following table indicates the number of passengers and amount of freight carried by this railway during the calendar years 1918 to 1927, inclusive:

Year	Passen- gers car- ried	Freight carried	Year	Passen- gers car- ried	Freight carried	Year	Passen- gers car- ried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1918	52,191	21,168	1922	66,122	52,455	1926	129,404	42,217
1919	89,687	23,645	1923	70,496	26,177	1927	160,090	51,528
1920	62,249	23,800	1924	73,431	34,101			
1921	65,827	21,072	1925	71,974	27,822			

¹ Estadística de los Ferrocarriles de Chile en Explotación.

RIGHT-OF-WAY CHARACTERISTICS

This discussion of right-of-way characteristics pertains only to the Ferrocarril Puente Alto al Volcan, which is operated by the war department.

Gage.—The railway is of 0.60-meter gage.

Grades.—The maximum upgrade is 3 per 100 for a distance of 781 meters, while the maximum down grade is 1.5 per 100.

Curves.—The minimum curve radius is 50 meters.

Rails.—Steel rails, 8 meters in length, weighing 15.15 kilograms to the meter, are used.

Ties.—Wood ties, 1.30 by 0.20 by 0.125 meters, spaced 1,625 to the kilometer, are used.

Water.—There are nine water stations, spaced an average distance apart of 6.9 kilometers. These water stations have a total capacity of 55 tons.

Fuel.—Coal is used for fuel. There are two coal stations, located an average distance apart of 30.9 kilometers, having a total capacity of 300 tons.

Culverts and small bridges.—There are 247 culverts and small bridges, with a total length of 166 meters.

Bridges.—There are 10 large bridges with an aggregate length of 230 meters.

Tunnels and galleries.—There are three tunnels and galleries in use, having a total length of 512 meters.

Employees.—During the calendar year ended December 31, 1927, the railway had 347 employees.

¹ Estadística de los Ferrocarriles de Chile en Explotación.

MOTIVE POWER AND ROLLING STOCK

At the end of the calendar year December 31, 1927, the railway owned the following motive power and rolling stock:

MOTIVE POWER	
Locomotives (4 in service and 2 in repair)	6
ROLLING STOCK	
Motor rail cars	5
Baggage cars	2
<hr/>	
Passenger cars:	
First class	5
Second class	3
Miscellaneous	1
<hr/>	
Total	9
<hr/>	
Freight cars:	
Box	3
Cattle	2
Gondola	14
Flat	13
<hr/>	
Total	32
<hr/>	
Total rolling stock	48

IQUIQUE TO PINTADOS RAILWAY

(Ferrocarri! Longitudinal Norte "second section")

This railway, which was constructed by the government as the second section of the Ferrocarril Longitudinal Norte, extends from Pintados to Iquique, a distance of 129 kilometers. In addition it has approximately 18 kilometers of side lines and branches. Provisional passenger traffic was inaugurated on January 23, 1929, while the first cargo was handled on March 23, 1929. The line, which is of meter gage (standard for the system), cost the Government to construct and place in operation up to January, 1929, approximately 3,140,000 pesos. The equipment at that time consisted of 12 coal-burning locomotives of German manufacture, 120 nitrate cars, 10 tank cars, and 10 coal cars. The passenger cars used were borrowed from the Chilean Northern Railway Co.

The railway, which is operated by the Ministerio de Fomento, Sección Ferrocarriles, will serve about 10 nitrate plants and be in direct competition with the line operated by the Nitrate Railways (Ltd.).

ARICA & TACNA RAILWAY CO.

The history of this railway dates from a concession, valid for 99 years, which was granted to J. Hegan in 1827. Under the terms of the concession, the railway was constructed from Tacna to Arica at a cost of about 17,600,000 pesos. The railway was opened to traffic in 1875 for a distance of 62 kilometers, which is its length at the present time.

OPERATING OFFICIALS

The directors and operating officials of the railway for the calendar year 1927 were as follows:

Chairman and managing director, J. A. Goudge, C. B. E., Dashwood House, E. C. 2, London.

Directors, J. T. Dillon, Dashwood House, E. C. 2, London; G. V. Hegan, R. N., 6, Adelaide Crescent, Hove, Sussex; T. J. Millen, 132 Dashwood House, E. C. 2, London; and C. E. Rich, 3, Cottessmore Gardens, Kensington, W. 8.

Secretary, T. J. Millen, 132, Dashwood House, London, E. C. 2.

General manager, engineer, and locomotive superintendent, M. E. Yorke Eliot, Tacna, Chile.

PURCHASES

Purchases are generally made through the London office, located at 132 Dashwood House, 9 New Broad Street. Small purchases are made locally through the office of the company in Tacna.

FINANCES

The company was capitalized in London for £500,000, in shares of £20 each. Of this amount, £400,000 has been issued and paid up. The balance sheet and revenue account for the calendar years ended (in Chile) on December 31, 1912, 1926, and 1927, are as follows:

BALANCE SHEET MADE UP TO DECEMBER 31, 1912, IN CHILE, AND TO MARCH 31, 1913, IN LONDON

CAPITAL AND LIABILITIES

	£	s.	d.	£	s.	d.
Capital authorized, 25,000 shares at £20 each.....	500,000	0	0			
Capital issued, 22,500 shares of £20 each fully paid....	450,000	0	0			
Sundry creditors.....	3,231	13	6			
Reserve.....	34,000	0	0			
Revenue account:	£	s.	d.			
Balance from last account.....	11,215	2	2			
Less dividend of 5s. per share paid June 19, 1912.....	5,625	0	0			
	5,590	2	2			
Net revenue, as per statement.....	6,513	16	3			
				12,103	18	5
				499,335	11	11

ASSETS

	£	s.	d.	£	s.	d.
Purchase of line, rolling stock, etc.....	450,000	0	0			
Expenditure thereon and additions to plant, etc., to Dec. 31, 1912 (less depreciation)---	16,070	11	9			
				466,070	11	9
Stock of stores, fuel, and timber.....				12,978	10	10
Sundry debtors.....	4,057	9	2			
Less provision for bad and doubtful debts---	1,019	8	6			
				3,038	0	8
Goods, etc., in transit.....				1,055	7	9
Investments and deposits at interest.....				12,155	0	0
Cash at bankers and in hand.....				4,038	0	11
				499,335	11	11

REVENUE ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1912, IN CHILE, AND
FOR THE YEAR ENDED MARCH 31, 1913, IN LONDON

DEBITS

	£	s.	d.	£	s.	d.
Working expenses in Chile:						
Administration and offices.....	2,470	15	6			
Locomotive charges.....	3,753	18	9			
Locomotive repairs.....	1,840	6	11			
Coach and car charges.....	1,451	16	2			
Coach and car repairs.....	519	3	2			
Station charges.....	307	1	7			
Station repairs.....	15	18	2			
Maintenance and relaying of line.....	3,537	12	1			
Workshops.....	385	3	5			
Miscellaneous charges.....	1,055	12	3			
Law charges.....	139	8	5			
Depreciation of rolling stock, plant, etc.....	1,039	7	1			
Provision for bad and doubtful debts.....	1,019	8	6			
Outstanding account written off.....	21	0	5			
				17,556	12	5
London charges:	£	s.	d.			
Rent of offices, salaries, etc.....	627	18	0			
Income tax.....	298	4	0			
Directors' remuneration.....	640	12	6			
Law charges.....	7	4	0			
				1,573	18	6
Depreciation of investments.....				277	10	0
Exchange.....				75	2	0
Balance.....				6,513	16	3
				25,996	19	2

CREDITS

	£	s.	d.	£	s.	d.
Traffic receipts:						
Goods.....	18,083	19	3			
Passengers.....	5,223	12	3			
Luggage.....	1,425	2	1			
Special traffic.....	823	0	3			
Sundries.....	91	15	5			
				25,647	9	3
Interest.....				349	9	11
				25,996	19	2

BALANCE SHEET MADE UP TO DECEMBER 31, 1926, IN CHILE, AND MARCH 31, 1927, IN LONDON

CAPITAL AND LIABILITIES

	£	s.	d.	£	s.	d.
Capital authorized, 25,000 shares at £20 each-----	500,000	0	0			
Capital issued, 22,500 shares of £20 each fully paid-----				450,000	0	0
Sundry creditors and credit balances-----				5,652	2	2
Exchange reserve-----				1,636	13	7
Reserve-----				40,000	0	0
Revenue account:	£	s.	d.			
Balance from last account-----	10,563	13	5			
Less dividend of 6s. 0d. per share paid Dec. 23, 1926-----	6,750	0	0			
	3,813	13	5			
Net revenue, as per statement-----	7,073	19	5			
				10,887	12	10
				508,176	8	7

ASSETS

	£	s.	d.	£	s.	d.
Purchase of line, rolling stock, etc-----	450,000	0	0			
Expenditure thereon and additions to plant, etc., to Dec. 31, 1926 (less depreciation)-----	13,679	15	8			
				463,679	15	8
Stock of stores, fuel, and timber-----				9,099	14	7
Sundry debtors-----				4,355	4	0
Goods, etc., in transit-----				984	11	5
Furniture, London office-----				149	17	3
Investments and deposit at interest-----				25,321	14	10
Cash at bankers and in hand-----				4,585	10	10
				508,176	8	7

BALANCE SHEET MADE UP TO DECEMBER 31, 1927, IN CHILE, AND TO MARCH 31, 1928, IN LONDON

CAPITAL AND LIABILITIES

	£	s.	d.	£	s.	d.
Capital authorized, 25,000 shares at £20 each-----	500,000	0	0			
Capital issued, 22,500 shares of £20 each fully paid-----				450,000	0	0
Sundry creditors and credit balances-----				5,247	4	4
Exchange reserve-----				1,636	13	9
Reserve-----	40,000	0	0			
Less repairs of damage by floods-----	3,106	13	5			
				36,893	6	7
Revenue account:						
Balance from last account-----	10,887	12	10			
Less dividend of 6s. per share, paid Dec. 29, 1927-----	6,750	0	0			
	4,137	12	10			
Less debit balance of revenue account-----	2,638	10	0			
				1,499	2	10
				495,276	7	6

ASSETS

	£	s.	d.	£	s.	d.
Purchase of line, rolling stock, etc.....	450,000	0	0			
Expenditure thereon and additions to plant, etc., to Dec. 31, 1927 (less depreciation)--	15,477	15	6			
				465,477	15	6
Stock of stores, fuel, and timber.....				9,802	13	8
Sundry debtors.....				2,445	12	2
Goods, etc., in transit.....				1,366	1	4
Furniture, London office.....				149	17	3
Investments.....				14,481	18	10
Cash at bankers and in hand.....				1,552	8	9
				495,276	7	6

REVENUE ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1926, IN CHILE, AND
FOR THE YEAR ENDED MARCH 31, 1927, IN LONDON

DEBITS

Working expenses in Chile:				£	s.	d.
Administration and offices.....				4,620	12	5
Locomotive charges.....				6,524	3	11
Locomotive repairs.....				3,369	1	0
Coach and car charges.....				1,906	12	4
Coach and car repairs.....				1,721	9	4
Station charges.....				7,752	18	9
Station repairs.....				113	5	5
Maintenance of line.....				2,678	7	8
Workshops.....				1,200	6	7
Miscellaneous charges.....				2,021	5	0
Law charges.....				25	10	0
Depreciation of rolling stock, plant, etc.....				964	6	2
				25,897	18	7
London charges:						
Rent of offices, salaries, etc.....	£	s.	d.			
	1,211	18	11			
Directors' remuneration.....	668	15	0			
				1,880	13	11
				7,073	19	5
				34,852	11	11

CREDITS

Traffic receipts:	£	s.	d.	£	s.	d.
Goods.....	19,138	14	1			
Passengers.....	8,182	2	0			
Luggage.....	1,886	1	8			
Special traffic.....	4,669	5	4			
Sundries.....	46	13	9			
				33,922	16	10
Interest.....				929	15	1
				34,852	11	11

REVENUE ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1927, IN CHILE, AND
FOR THE YEAR ENDED MARCH 31, 1928, IN LONDON

DEBITS

Working expenses in Chile:				£	s.	d.
Administration and offices.....				4,208	2	7
Locomotive charges.....				5,004	7	3
Locomotive repairs.....				1,532	13	9
Coach and car charges.....				1,445	0	2
Coach and car repairs.....				962	14	7
Station charges.....				638	9	2
Station repairs.....				36	13	2
Maintenance of line.....				1,730	18	3

Working expenses in China—Continued.

	£	s.	d.
Workshops.....	1, 122	14	3
Miscellaneous charges.....	1, 891	11	0
Law charges.....	66	13	7
Depreciation of rolling stock, plant, etc.....	1, 009	3	4
	19, 649	1	1

London charges:

Rent of office, salaries, etc.....	1, 275	10	0
Directors' remuneration.....	668	15	0
Chairman's expenses visiting Chile.....	35	0	0
	1, 979	5	0
	21, 628	6	1

CREDITS

	£	s.	d.	£	s.	d.
Traffic receipts:						
Goods.....	9, 840	13	4			
Passengers.....	4, 034	0	2			
Luggage.....	1, 126	4	5			
Special traffic.....	2, 840	4	4			
Sundries.....	69	0	0			
				17, 910	2	3
Interest.....				1, 079	13	10
Balance.....				2, 638	10	0
				21, 628	6	1

TRAFFIC

The freight and passenger traffic of the railway for the calendar years 1918 to 1927 are shown in the following table:¹

Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1918.....	26, 827	20, 804	1922.....	20, 960	16, 773	1926.....	33, 426	18, 479
1919.....	20, 037	19, 810	1923.....	21, 887	17, 687	1927.....	30, 511	11, 724
1920.....	22, 668	23, 922	1924.....	20, 177	17, 989			
1921.....	22, 877	20, 804	1925.....	27, 856	20, 744			

¹ Data from Anuario Estadística de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The railway runs from 3 meters above sea level at Arica to 530 meters at Tacna, which is the highest point on the line.

Gage.—The gage of the line is 1.435 meters.

Grades.—The maximum upgrade is 2.6 per cent for 460 meters, while the maximum down grade is 0.88 per cent for 420 meters.

Curves.—The radius of the sharpest curve is 153 meters.

Ballast.—Gravel is used for ballast.

Ties.—Ties 2.70 by 0.20 by 0.15 meters of Chilean oak, spaced 1,430 to the kilometer, are used.

Rails.—Rails, weighing 28 kilograms to the meter in 9.14 meter sections, are used.

Water.—Water is secured from wells and stored in steel tanks. There are two water stations an average distance apart of 30 kilometers. One of the stations lies in a desert section and water is taken there by train.

¹ Data from Estadística de los Ferrocarriles de Chile en Explotación.

Fuel.—Both coal and oil are used for fuel. Two coal stations having a total capacity of 1,000 tons, are located approximately 30 kilometers apart. There is also one gasoline station, having a capacity of 3 tons.

Employees.—The railway employs 118 persons.

Maintenance.—The railway is kept in good condition.

Culverts and small bridges.—There are 42 culverts and small bridges with a total length of 51 meters.

Bridges.—There are three bridges on the line with a total length of 95 meters. These bridges are constructed on concrete or stone piers with wooden beams.

Tunnels.—There are no tunnels on the line.

MOTIVE POWER AND ROLLING STOCK

The motive power at the end of the calendar year, 1927, consisted of seven locomotives weighing 60 tons each. These locomotives are of the 4-wheel type having cylinders 16 by 24 inches. The rolling stock consists of 3 first-class passenger cars, 3 second-class passenger cars, 2 miscellaneous coaches, 15 box cars, 10 cattle cars, 9 gondola cars, 12 flat cars, 6 special cars, and 7 auto rail cars.

Couplers.—Link and pin couplers are used.

Repair shops.—There is one repair shop located at Tacna which, when working to capacity, employs 200 men. This shop is capable of handling castings weighing 2 tons. An average of 4 locomotives and 20 cars are repaired yearly.

ANTOFAGASTA (CHILE) & BOLIVIA RAILWAY CO. (LTD.)

This British company is the owner and operator of the largest independent railway system in Chile, and is also the owner and operator of telegraph lines, mining properties, and waterworks. Its history dates back to a concession granted by the Government of Bolivia and the Province of Antofagasta in Chile to the *Compañía de Salitres de Antofagasta* for the construction of a 2-foot 6-inch gage railway from Antofagasta to Pampa Alta, in 1877. Another early development in connection with its origin was the organization of the *Compañía Huanchaca de Bolivia* formed in 1873, to develop the Pulacayo mines in the Department of Potosí, Bolivia. The company was successful from its inception but was greatly handicapped by transportation difficulties. At first its mineral products were exported through the Port of Cogiba, requiring an 18-day trip in animal-drawn vehicles over about 480 kilometers of poor roads. Later, as a result of the war of the Pacific, it became necessary to find an outlet to the Atlantic through Rosario, Argentina. Owing to the expense in transporting the mineral to the coast, the company decided to solve its transportation problems by having the railway extended to Pulacayo, and on January 17, 1884, it obtained a concession from the Chilean Government to extend the line to this point.

About this time difficulties arose between the *Compañía de Salitres de Antofagasta* and the *Huanchaca Mining Co.* regarding the joint construction and operation of this railway. Accordingly the *Huanchaca Mining Co.* bought out the *Compañía de Salitres de Antofagasta* for 3,000,000 paper pesos. The *Huanchaca Mining Co.* at this time having a number of important projects on its hands sold the line and transferred its concessions granted by the Governments of Chile and Bolivia to the *Antofagasta (Chile) & Bolivia Railway Co. (Ltd.)* which was registered in London on November 21, 1888, and capitalized at £2,150,000. Under the terms of the concessions which it acquired, the Chilean Government guaranteed 6 per cent interest for 20 years from 1887 on a capital investment of 3,472,000 gold pesos (18s.) used in the construction of a portion of this line in Chile, and the Bolivian Government guaranteed 6 per cent interest for a period of 20 years from the completion of the line in June, 1892, upon a capital investment of £750,000 on lines constructed in Bolivia. To date, the Government guarantees have not been called for. The line belongs to the company in perpetuity, there being no option of Government purchase. The *Huanchaca Mining Co.* retained the right to work the line for 15 years up to January 1, 1904, at 55 per cent of the gross receipts and water works at cost price. It guaranteed interest on the debentures and 6 per cent on capital, any surplus profit being equally divided. Since January 1, 1904, the railway has been operated by the *Antofagasta (Chile) & Bolivia Railway Co. (Ltd.)*. In the meantime construction work was carried on under the original concession and the main line opened to Uyuni, a distance of 612 kilometers in 1889.

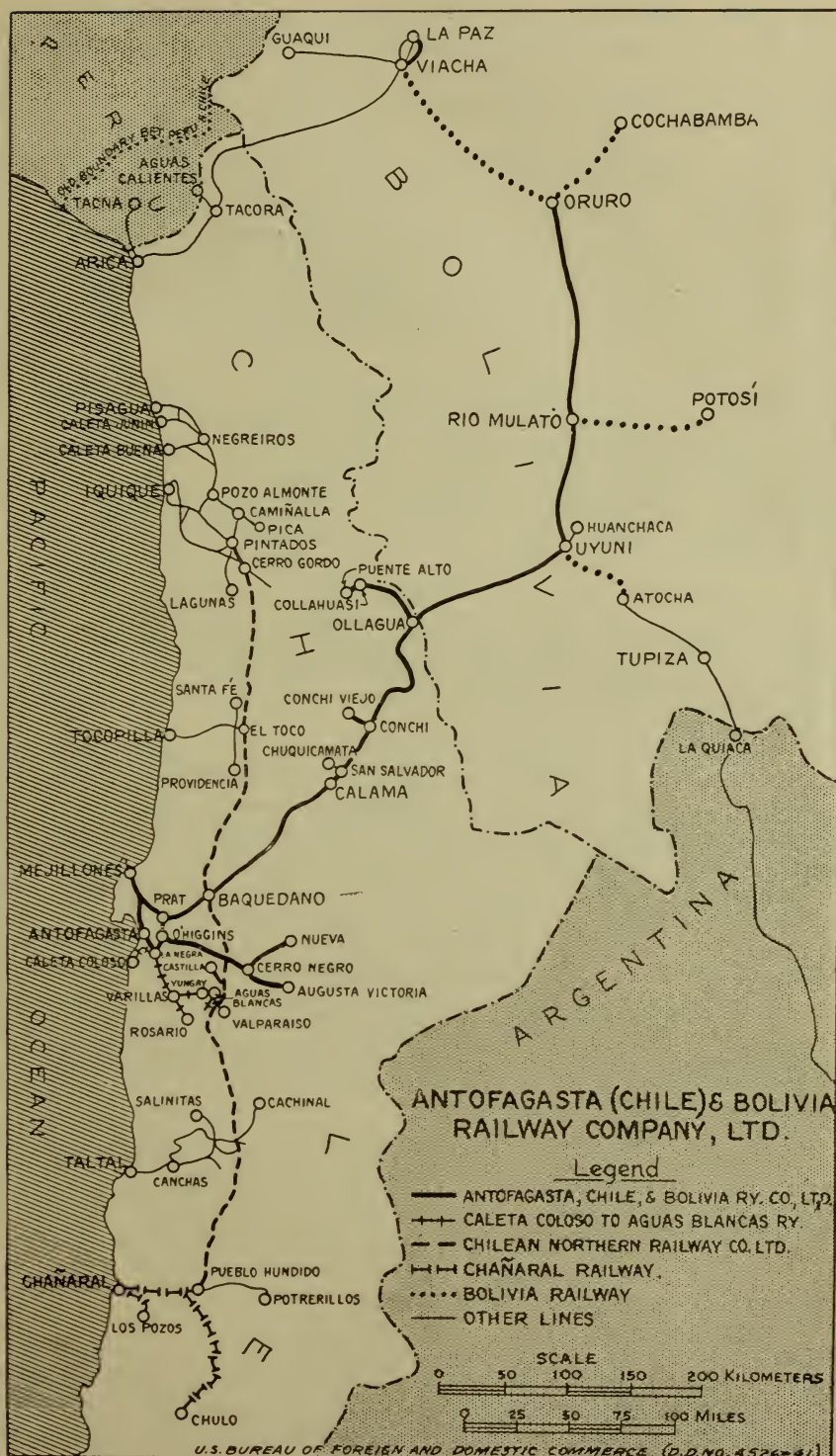


FIGURE 32

In April of the same year a branch was constructed from Uyuni to connect Pulacayo and the Huanchaca silver mines with the main line, a distance of 33 kilometers. This line was retained by the Huanchaca Mining Co. when it sold the railway to its present owners and since that time it has been operated by that company. In 1892 the main line was opened as far as Oruro, a distance of 929 kilometers. This is the end of the 2-foot 6-inch track and also the line originally constructed by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.). Incidentally, the company in 1928 finished converting all its 2-foot 6-inch gage track to meter gage, which is standard for the entire system. While this main line was under construction various branches were built under additional concessions granted the company by the Chilean Government, which although carrying no guarantee are to belong to the company in perpetuity. A branch from San Salvador to Chuquicamata, a distance of 9 kilometers, was opened in 1902. Chuquicamata is 2,697 meters above sea level and is the center of a copper mining region. The branch from Conchi to Conchi Viejo, a distance of 20 kilometers, was opened in February, 1902. Conchi Viejo is also in the copper mining region. The branch from Prat, at kilometer 59, on the main line, to the Port of Mejillones, to Antofagasta, a distance of 129 kilometers, was opened in March, 1908. Mejillones is reported to have the best natural harbor on the Pacific coast of South America. In April, 1908, a branch line was constructed from Ollague to the copper mining region of Collahuasi, terminating at Punto Alto, a distance of 95 kilometers. The altitude of this region is 4,820 meters above sea level.

A junction with the Caleta Coloso to Aguas Blancas Railway, a distance of 10 kilometers, was effected in March, 1911. In 1908 a branch was constructed from O'Higgins, at kilometer 36 on the main line, to Boquete and the nitrate fields of Pissis and Domeyko, a distance of 112 kilometers. In 1912 an extension from Cerro Negro to Augusta Victoria, a distance of 42 kilometers, was opened. The railway from Oruro to Viacha (207 kilometers) and La Paz (32 kilometers) as well as the branches to Potosi (174 kilometers), Atocha (90 kilometers), and Cochabamba (205 kilometers), were constructed by the Bolivian Railway Co., which on January 1, 1909, was leased by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.). The line from Viacha to La Paz, 32 kilometers in length, was reconstructed by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.) so it is now directly owned by that company. In all, the main line extends from Antofagasta to La Paz, a distance of 1,168 kilometers. On July 1, 1919, it took over the operation of the Chilean Northern Railway Co. (Ltd.), which is 713 kilometers in length and extends from Pueblo Hundido to Pintados, and is a section of the Ferrocarril Longitudinal Norte. Through the Chilean Northern Railway Co. it secured the operation of the Ferrocarril Chañaral, a line 280 kilometers in length and extending from Chanaral to Pueblo Hundido with principal branches to Chulo and Los Pozos. This is leased annually to the Chilean Northern Railway Co. The company also owns and operates the Ferrocarril Caleta Coloso a Aguas Blancas, 266 kilometers in length and extending from the port of Caleta Coloso to Aguas Blancas with branches into the nitrate fields. On

December 31, 1926, the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.) owned or operated the following kilometerage:

	Kilometers
Antofagasta and Mejillones to Oruro (main line and branches).....	1, 346
Viacha to La Paz (main line).....	32
Bolivian Railway Co. (leased lines):	
Uyuni to Atocha.....	90
Rio Mulato to Potosi.....	174
Oruro to Cochabamba.....	205
Oruro to Viacha (main line).....	207
Chilean Northern Railway Co. (operated only) (main line):	
Pueblo Hundido to Pintados.....	713
Chanaral Railway (leased yearly to Chilean Northern Railway Co.)..	280
Caleta Coloso to Aguas Blancas Railway (owned).....	266
Total.....	3, 313

The company also owns moles and floating stock at the ports of Antofagasta, Mejillones, and Colosso. For details regarding this equipment, see under heading, "Motive power and rolling stock." It also owns an extensive water-supply system for furnishing water to the nitrate industry and the town of Antofagasta. The water is brought by pipe lines from the Siloli Springs, about 286 miles inland from Antofagasta.

RAILWAY OFFICIALS

The company being British owned, its entire directorate is located in London. In South America there are two separate administrations; one at Antofagasta which covers the lines in Chile, and the other at La Paz for the Bolivian lines. For the calendar year ended December 31, 1926, the names and addresses of the directors and operating officials of the company are as follows:

Directors.—Lord Lawrence of Kingsgate, chairman, 23 Eaton Square, London, S. W. 1; A. W. Bolden, managing director, 1 Broad Street Place, London, E. C. 2; The Hon. Cecil A. Campbell, 37 Bryanston Square, London, W. 1; Sir Bernard E. Greenwell, Bart., 2 Finch Lane, London, E. C. 3; Henry F. Tiarks, 145 Leadenhall Street, London, E. C. 2; Col. H. Le Roy-Lewis, C. B., C. M. G., D. S. O., Wilderton, Manor Road, Bournemouth; R. J. Hose, 117 Old Broad Street, E. C. 2.

Secretary.—A. H. Clinch, 1 Broad Street Place, London, E. C. 2.

OPERATING OFFICIALS

General managers.—A. G. Hunt (Chilean section), Antofagasta, Chile; A. E. Heskett (Bolivian section), La Paz, Bolivia.

Accountants.—E. W. White (Chilean section), Antofagasta, Chile; R. W. Martin (Bolivian section), La Paz, Bolivia.

Resident engineers.—J. H. C. Taylor (Chilean section), Antofagasta, Chile; H. S. Brown (Bolivian section), La Paz, Bolivia.

Chief mechanical engineers.—H. R. Hood (Chilean section), Mejillones, Chile; F. Fraitag (Bolivian section), Uyuni, Bolivia.

Stores superintendents.—W. Tustain (Chilean section), Mejillones, Chile; A. D. Fairweather (Bolivian section), Oruro, Bolivia.

Traffic managers.—J. G. Thompson (Chilean section), Antofagasta, Chile; W. A. Pickwood (Bolivian section), Oruro, Bolivia.

PURCHASES

Purchases for both sections of the railway are indicated by the official in charge of the work for which the purchase is to be made, then approved by the general manager of the particular section which is originating the purchase, and if of a minor nature, purchased by

the local stores superintendent or if of a major character, referred to London where, as a rule, all purchases are made.

FINANCES ¹

The total authorized capital (ordinary and preference) is £8,000,000, of which £7,578,560 is issued and outstanding, and the total authorized borrowing powers of £6,000,000 have been exercised to the extent of £4,908,950. On December 31, 1927, there was a debt to capital account of £1,553,271; in this account the acquisition of Bolivia Railway bonds and common stock stood at £3,205,631. In June, 1920, 1,838,400 ordinary shares of £1 each were created, and at the same time it was decided to capitalize £1,416,960 of the reserves, and to issue six new ordinary shares fully paid in respect of every £100 of preferred ordinary stock and 60 new ordinary shares in respect of every £100 of deferred ordinary stock held, these new ordinary shares being subsequently converted into consolidated ordinary stock under a scheme sanctioned by the proprietors and duly carried out, by which the then preferred ordinary and deferred ordinary stocks were converted into a new consolidated ordinary stock. The old preferred ordinary stock ranked first for 5 per cent noncumulative dividends, and equally with the old deferred ordinary in surplus profits beyond 10 per cent on the latter, and for each £100 of old preferred ordinary stock there was issued £106 of new consolidated ordinary stock, and for every £100 of old deferred ordinary stock there was issued £160 of new ordinary stock.

Consolidated ordinary stock, £5,578,560, including £1,416,960 issued as a bonus to the old preferred and deferred ordinary stockholders out of reserves. There are also authorized but unissued 421,440 ordinary shares of £1.

Five per cent cumulative preference stock, £2,000,000, the total authorized, with dividends payable at the beginning of January and July. Of this amount £650,000 was offered for sale in April, 1908 (by J. Henry Schroder & Co., 145 Leadenhall Street, E. C. 3, the purchasers), to the existing proprietors at 95 per cent. The stock has priority as regards capital over the consolidated ordinary stock.

Four per cent perpetual debenture stock, £1,000,000. The greater part of this stock was issued in June, 1890, and December, 1891, in exchange for the preexisting railway bonds, while the cash subscription price in June, 1890, was 99 per cent, and in December, 1891, 93; in December, 1900, £150,000 was placed at 97½ per cent. The conversion and issue in 1890-91 were effected by Frederick Huth & Co., 12 Tokenhouse Yard, E. C. 2, and J. Henry Schroder & Co., 145 Leadenhall Street, E. C. 3. Interest on the debenture stock is payable January 1 and July 1. The stock is limited to £1,000,000, and is secured by a first floating charge on the entire system of railways.

Four and a half per cent debenture stock, £1,000,000 being the total authorized, ranking next after the foregoing. The stock was issued through J. Henry Schroder & Co., 145 Leadenhall Street, E. C. 3.—half in June, 1904, at 98 per cent, and half in May, 1906, at 105 per cent—interest payable May 1 and November 1, and is repayable at 105 per cent on January 1, 1940, the company, however, having reserved power of redemption before that date by purchase in

¹ Stock Exchange Yearbook, 1929.

the open market or by public tender, and in the event of liquidation for reconstruction or amalgamation the stock is not to be repaid at less than 105 per cent.

Five per cent debenture stock, £1,500,000 of which £1,000,000 was offered for sale in May, 1907, by J. Henry Schroder & Co., 145 Leadenhall Street, E. C. 3, at 103 per cent, that firm having previously acquired the whole issue, and the balance was disposed of in 1908. Interest is payable May 1 and November 1, and the stock is repayable at 110 per cent on January 1, 1940, but the company has reserved power to redeem before that date by purchase in the open market or by public tender, and in the event of the liquidation of the company for reconstruction or amalgamation the stock is not to be repaid at less than 110 per cent. The amount of the stock can be increased from £1,500,000 only with the consent of the trustees, and in no case can the amount be increased by a sum in excess of £2,000 per mile of additional line to be acquired or constructed by the company. The stock ranks after the foregoing 4 and 4½ per cent debenture stocks.

Five per cent (Bolivia) debenture stock, £1,408,950, £600,000 offered for sale at 102 per cent by J. Henry Schroder & Co., 145 Leadenhall Street, London E. C. 3, in July, 1910; £300 issued in 1916 for like amount of 6 per cent secured notes; and £808,650 issued in exchange for 7½ per cent convertible notes.

Authorized, £2,500,000. Interest May 1 and November 1. Redeemable at 110 per cent July 1, 1960, or (whole amount) on any interest date on six months notice from company; or at not less than 110 per cent in event of liquidation for reconstruction or amalgamation. Secured by specific charge upon £1,875,000 series B income bonds of the Bolivia Railway Co. (already delivered to Antofagasta & Bolivia Railway Co.); on these bonds of Bolivia Railway Co., interest was guaranteed by Bolivian Government up to December 31, 1926, when bonds fell due for repayment (bonds were not returned at due date and interest for 1927 is in arrears). Debenture stock is also secured by a floating charge on entire undertaking of Antofagasta & Bolivia Railway Co., subject to the authorized issues of debenture stocks.

The following tables show the balance sheet, revenue account, and net revenue account of the company for the calendar years ended December 31, 1926 and 1927.

BALANCE SHEET, YEAR ENDED DECEMBER 31, 1926

LIABILITIES				£	s.	d.
Working capital.....				50,000	0	0
Reserve account, as per last account.....				1,000,000	0	0
Fire and marine insurance fund:	£	s.	d.			
As per last account.....	278,692	16	1			
Add transfers and interest on investments for 1926.....	22,058	14	10			
				300,751	10	11
Renewal accounts.....				1,609,307	8	8
Debenture amortization reserve account.....				510,000	0	0
Debenture stockholders, for interest on debenture stocks accrued at Dec. 31, 1926, less tax.....				41,392	19	6
Preference stockholders, for final dividend on 5 per cent cumulative preference stock, paid Jan. 1, 1927.....				50,000	0	0

Sundry creditors and credit balances:

	£	s.	d.	£	s.	d.
London (including unclaimed debenture interest and dividends and provision for taxation)-----	850,712	18	5			
Chile-----	173,218	11	3			
Bolivia-----	477,039	9	4			
				1,500,970	19	0
Aguas Blancas Railway, balance of current account-----				283,565	1	11
Net revenue account ² -----				469,035	18	7
				5,815,023	18	7

ASSETS

	£	s.	d.	£	s.	d.
Capital account, balance per account No. 2-----	1,189,337	19	3			
Stores, provisions, etc., in hand and in transit-----	582,485	8	7			
Fire and marine insurance fund investments, at cost or under ³ -----	278,750	16	10			
Difference between nominal amounts of 7½ per cent notes and 5 per cent (Bolivia) debenture stock issued in exchange-----	209,650	0	0			
Bolivia Railway Co., amount recoupable in respect of construction expenditure-----	44,088	3	11			
Sundry debtors and debit balances:	£	s.	d.			
London-----	96,864	0	11			
Chile-----	85,157	4	6			
Bolivia-----	56,816	5	3			
				238,837	10	8
Investments, at cost or under ⁴ -----	2,438,628	18	5			
Bills receivable, in hand and in transit (since received)-----	414,438	9	10			
Cash at bankers and in hand:	£	s.	d.			
London and New York-----	175,348	12	2			
Chile-----	38,781	17	3			
Bolivia-----	204,676	1	8			
				418,806	11	1
				5,815,023	18	7

BALANCE SHEET, YEAR ENDED DECEMBER 31, 1927

LIABILITIES

	£	s.	d.	£	s.	d.
Working capital-----	50,000	0	0			
Reserve account, as per last account-----	1,000,000	0	0			
Fire and marine insurance fund:	£	s.	d.			
As per last account-----	300,751	10	11			
Add transfers and interest on investments for 1927-----	15,585	4	10			
				316,336	15	9
Renewal accounts-----	1,511,104	18	7			
Debenture amortization reserve account-----	612,000	0	0			
Debenture stockholders, for interest on debenture stocks accrued at Dec. 31, 1927, less tax-----	41,392	19	10			
Preference stockholders, for final dividend on 5 per cent cumulative preference stock, paid Jan. 1, 1928-----	50,000	0	0			

² From this amount a dividend of 4 per cent on the consolidated ordinary stock is recommended, which will require £223,142 8s. 0d., the balance, £245,893 10s. 7d., to be carried forward. The company has given guaranties in respect of debenture stock of the Aguas Blancas Railway Co.

³ The total value of these investments at Dec. 31, 1926, was calculated at £261,928.

⁴ The total value of these investments at Dec. 31, 1926, was calculated at £2,448,378. Included in these investments is £62,500 4 per cent funding loan deposited to the order of the Chilean Government as guaranty of £50,000 under terms of Chilean Northern Longitudinal Railway concession.

Sundry creditors and credit balances:

	£	s.	d.	£	s.	d.
London (including unclaimed debenture interest and dividends and provision for taxation)-----	859,247	0	8			
Chili-----	143,388	1	10			
Bolivia-----	544,587	8	7			
				1,547,222	11	1
Aguas Blancas Railway, balance of current account-----				291,849	0	10
Net revenue account ⁵ -----				474,454	12	2

5,894,360 18 3

ASSETS

	£	s.	d.	£	s.	d.
Capital account, balance per account No. 2-----	1,553,270	16	8			
Stores, provisions, etc., in hand and in transit-----	647,000	19	5			
Fire and marine insurance fund investments, at cost or under ⁶ -----	300,630	18	0			
Difference between nominal amounts of 7½ per cent notes and 5 per cent (Bolivia) debenture stock issued in exchange-----	209,650	0	0			
Bolivia Railway Co., amount recoupable in respect of construction expenditure-----	59,282	15	6			
Sundry debtors and debit balances:	£	s.	d.			
London-----	62,632	6	9			
Chili-----	72,364	16	2			
Bolivia-----	95,502	19	11			
				230,500	2	10
Investments, at cost or under ⁷ -----				2,441,336	12	5
Bills receivable, in hand and in transit (since received)-----				299,553	18	3
Cash at bankers and in hand:	£	s.	d.			
London and New York-----	13,220	14	8			
Chili-----	47,577	12	10			
Bolivia-----	92,336	7	8			
				153,134	15	2
				5,894,360	18	3

REVENUE ACCOUNT, YEAR ENDED DECEMBER 31, 1926

LIABILITIES

	£	s.	d.
Permanent way and works maintenance, abstract A-----	227,474	14	0
Locomotives maintenance, abstract B-----	135,160	18	4
Coaching stock maintenance, abstract C-----	17,947	13	1
Wagon stock maintenance, abstract D-----	83,236	17	2
Locomotives running, abstract E-----	259,958	19	4
Vehicles running, abstract F-----	8,599	12	5
Traffic expenses, abstract G-----	136,363	13	10
General charges, abstract H-----	225,108	17	6
Mole expenses, abstract I-----	93,933	18	9
Hire, etc., of foreign rolling stock-----	4,116	2	7
Total working expenditure-----	1,191,901	7	0
Balance carried to net revenue account No. 5-----	592,699	0	3
	1,784,600	7	3

⁵ From this amount a dividend of 4 per cent on the consolidated ordinary stock is recommended, which will require £223,142 8s. 0d., the balance, £251,312 4s. 2d., to be carried forward. The company has given guaranty in respect of debenture stock of the Aguas Blancas Railway Co.

⁶ The total value of these investments at Dec. 31, 1927, was calculated at £288,722.

⁷ The total value of these investments at Dec. 31, 1927, was calculated at £2,475,371. Included in these investments is £62,500 4 per cent funding loan deposited to the order of the Chilean Government as guaranty of £50,000 under terms of Chilean Northern Longitudinal Railway concession.

ASSETS	£	s.	d.
Passengers.....	125,831	15	5
Excess luggage, parcels.....	37,126	11	3
Goods and livestock.....	1,486,963	17	4
Special trains, etc.....	2,553	0	11
Telegrams.....	620	4	9
Storage and demurrage.....	4,333	6	0
Sundry receipts.....	40,429	18	3
Mole receipts.....	86,719	14	0
Hire, etc., of rolling stock to foreign lines.....	21	19	4
	1,784,600	7	3

REVENUE ACCOUNT, YEAR ENDED DECEMBER 31, 1927

LIABILITIES	£	s.	d.
Permanent way and works maintenance, abstract A.....	158,641	4	0
Locomotive maintenance, abstract B.....	111,933	16	11
Coaching stock maintenance, abstract C.....	15,496	7	4
Wagon stock maintenance, abstract D.....	62,158	6	6
Locomotive running, abstract E.....	229,352	9	6
Vehicle running, abstract F.....	7,694	6	6
Traffic expenses, abstract G.....	130,053	14	1
General charges, abstract H.....	208,776	5	6
Mole expenses, abstract I.....	77,573	3	4
Hire, etc., of foreign rolling stock.....	4,546	0	1
Total working expenditure.....	1,006,225	13	9
Balance carried to net revenue account No. 5.....	613,548	16	10
	1,619,774	10	7

ASSETS	£	s.	d.
Passengers.....	103,775	18	9
Excess luggage, parcels.....	29,026	6	11
Goods and livestock.....	1,364,389	7	2
Special trains, etc.....	1,495	11	11
Telegrams.....	978	4	11
Storage and demurrage.....	5,479	16	10
Sundry receipts.....	40,627	17	2
Mole receipts.....	73,801	16	5
Hire, etc., of rolling stock to foreign lines.....	199	10	6
	1,619,774	10	7

NET REVENUE ACCOUNT, YEAR ENDED DECEMBER 31, 1926

LIABILITIES	£	s.	d.	£	s.	d.
Interest on debenture stocks:						
4 per cent perpetual debenture stock.....	40,000	0	0			
4½ per cent debenture stock.....	45,000	0	0			
5 per cent debenture stock.....	75,000	0	0			
5 per cent (Bolivia) debenture stock.....	45,731	5	0			
				205,731	5	0
Interest on 7½ per cent 5-year secured convertible notes.....				27,525	0	0
Dividends paid or declared in respect of 1926:						
Interim and final dividends on 5 per cent cumulative preference stock.....				100,000	0	0
Interim dividend of 3 per cent on consolidated ordinary stock.....				167,356	16	0
Provision for income tax.....				25,000	0	0
Staff benevolent fund.....				15,000	0	0
Balance as per balance sheet No. 6.....				469,035	18	7
				1,009,648	19	7

ASSETS					
	£	s.	d.	£	s. d.
Balance, per balance sheet:					
Dec. 31, 1925.....	384,860	8	8		
Less final dividend of 4 per cent on consolidated ordinary stock.....	223,142	8	0		
				161,718	0 8
Balance of revenue account for the year 1926 as per account No. 4:					
Railway.....	592,699	0	3		
Waterworks.....	24,063	17	2		
				616,762	17 5
Interest on Bolivia Railway bonds and income from investments, etc.....				230,823	10 6
Registration fees, etc.....				344	11 0
				1,009,648	19 7

NET REVENUE ACCOUNT, YEAR ENDED DECEMBER 31, 1927

LIABILITIES					
	£	s.	d.	£	s. d.
Interest on debenture stocks:					
4 per cent perpetual debenture stock.....	40,000	0	0		
4½ per cent debenture stock.....	45,000	0	0		
5 per cent debenture stock.....	75,000	0	0		
5 per cent (Bolivia) debenture stock.....	70,447	10	0		
				230,447	10 0
Dividends paid or declared in respect of 1927:					
Interim and final dividends on 5 per cent cumulative preference stock.....				100,000	0 0
Interim dividend of 3 per cent on consolidated ordinary stock.....				167,356	16 0
Staff benevolent fund.....				15,000	0 0
Balance as per balance sheet No. 6.....				474,454	12 2
				987,258	18 2

ASSETS					
	£	s.	d.	£	s. d.
Balance, per balance sheet:					
Dec. 31, 1926.....	469,035	18	7		
Less final dividend of 4 per cent on consolidated ordinary stock.....	223,142	8	0		
				245,893	10 7
Balance of revenue account for the year 1927 as per account No. 4:					
Railway.....	613,548	16	10		
Waterworks.....	21,078	14	6		
				634,627	11 4
Income from investments, etc.....				106,434	18 3
Registration fees, etc.....				302	18 0
				987,258	18 2

FREIGHT AND PASSENGER TRAFFIC

Freight traffic.—The principal articles of freight carried by the railway are nitrate, borax, copper bars, copper ore, tin ore, coal, fuel oil, machinery, and general cargo, as shown in the following table:

Commodity	1921	1922	1925	1926	1927
CHILEAN SECTION					
	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>
Manufactured nitrate.....	179,436	306,719	787,139	454,199	591,844
Borate.....	14,692	33,182	38,900	34,854	21,462
Sulphur.....	1,583	2,111	6,149	3,052	-----
Huanchaca metals.....	14,155	15,039	9,374	6,093	-----
Copper ores.....	9,792	14,210	6,836	9,768	10,584
Copper bars.....	21,190	67,573	98,410	98,561	101,554
Tin ores.....	25,074	44,233	44,622	47,615	52,138
Antimony, bismuth, and wolfram.....	41	283	-----	-----	-----
General merchandise.....	45,908	44,114	91,471	74,409	58,173
Mining articles.....	31,264	51,946	128,235	141,848	79,686
Chilean products.....	23,871	26,987	25,593	31,207	29,096
Coal.....	41,139	22,038	65,344	46,226	41,106
Petroleum.....	104,494	73,611	183,319	156,016	120,745
Company's materials.....	80,485	65,062	-----	-----	117,720
Silver and lead slag.....	-----	-----	14,259	9,347	-----
Lead ores.....	-----	-----	3,560	11,146	-----
Silver and lead ores mixed.....	-----	-----	4,617	9,384	13,356
Total.....	593,124	767,108	1,507,828	1,133,725	1,237,461
BOLIVIAN SECTION					
Tin.....	41,707	71,504	74,533	81,171	82,020
Mining articles.....	15,467	19,517	27,799	29,443	31,519
General merchandise.....	22,212	21,988	28,920	28,866	28,894
Silver.....	17,193	23,481	31,197	42,603	51,200
Huanchaca metals.....	14,136	15,040	9,193	6,132	3,345
Coal.....	4,122	8,543	8,498	5,134	7,126
Petroleum in drums.....	5,419	6,016	8,346	9,514	11,058
Explosives and inflammables.....	2,940	3,085	-----	-----	-----
Cocoa.....	3,455	3,244	3,094	3,594	3,454
Cereals.....	2,536	2,336	3,613	3,972	3,288
Firewood.....	14,072	10,238	12,551	12,548	12,477
Flour.....	3,517	3,518	5,894	6,073	5,829
Company's materials.....	32,689	20,200	27,977	40,175	57,513
Lead and silver slag.....	-----	-----	14,068	9,501	3,986
Silver and lead ores.....	-----	-----	5,205	9,518	13,406
Antimony.....	-----	-----	1,908	6,188	5,069
Lead ores.....	-----	-----	3,592	11,226	267
Total.....	179,465	208,710	266,388	305,658	320,451

Passenger traffic.—The following table shows the number of passengers carried and the receipts from passenger traffic for the calendar years ended December 31, 1921, 1922, 1925, 1926, and 1927.

	1921	1922	1925	1926	1927
CHILEAN SECTION					
Passengers carried.....number.....	332,569	206,865	399,311	313,706	237,740
Passenger receipts.....	£60,049	£46,106	£81,103	£68,339	£50,565
BOLIVIAN SECTION					
Passengers carried.....number.....	252,820	209,579	264,476	231,457	204,034
Passenger receipts.....	£44,004	£40,576	£57,184	£57,492	£53,211

RIGHT-OF-WAY CHARACTERISTICS

For this discussion of the right of way of the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), the system has been divided into the following three sections: Antofagasta, Mejillones to Ollague and branches; Ollague to Oruro; and Viacha to La Paz.

ANTOFAGASTA, MEJILLONES, TO OLLAGUE AND BRANCHES SECTION

Altitude.—The railway runs from sea level to 3,955 meters at Ascotan, a distance of 300 kilometers. This is the highest point on the line excluding the altitude reached on the Collahuasi branch which attains an altitude of 4,826 meters above sea level and is one of the highest in the world.

Gage.—The gage of the line is 1 meter, standard for the entire system.

Grades.—The maximum grade on the line is 3 per cent. The highest grades are found between Antofagasta and Porte Zuelo in a distance of 29 miles where the grades average from 1 in 30 to 1 in 50. On the Chuquicamata branch, the maximum grade is 4.62 per cent. The maximum grade on the Collahuasi branch is 8.08.

Curves.—The radius of the minimum curve on the line is 120 meters. On the Chuquicamata and Collahuasi branches the radius of the minimum curves range from 120 to 130 meters.

Rails.—Rails weighing 65 to 75 pounds to the yard are used.

Fuel.—Oil is used as fuel in the main line locomotives.

Clearance and loading.—Cars on the 2-foot 6-inch gage have a standard capacity of 20 tons and on the meter gage, the capacity ranges from 28 to 35 tons.

Bridges.—At kilometer 300 on the main line, a short distance from Conchi, is located the Loa Viaduct. This bridge consists of six lattice girder spans of 80 feet each, supported on steel trestle towers. It is 336 feet above the level of the Loa River over which it affords a crossing.

Signaling.—The electric staff system is used for signaling. At some points along the line, instruments are either of the automatic or semiautomatic type. On sections where the staff system is not used, signaling is carried on by telegraph or telephone communication. On certain sections the Webb-Thompson electric staff apparatus is installed. Between Antofagasta and Calama the Western Electric train-control system has been installed.

Repair shops and freight yards.—The principal freight yards are located at Antofagasta (capacity, 1,300 cars of both meter and 2-foot 6-inch gage), Mejillones (capacity, 1,000 cars), Porte Zuelo (capacity, 320 cars), Baquedano (capacity, 200 cars), Galama (capacity, 200 cars), Coloso (capacity, 250 cars), Uyuni, Viacha, and Oruro.

OLLAGUE-ORURO (MAIN LINE) SECTION

Altitude.—The highest point on the railway is found about 11 kilometers north of Quehua, where the altitude reaches 3,888 meters above sea level.

Gage.—The gage is 1 meter.

Grades.—The maximum grade on the line is 1.1 per cent.

Curves.—The radius of the smallest curve on the line is 190 meters.

Bridges.—There are 27 bridges with an aggregate length of 1,501 meters. These bridges are as follows:

	Meters
20 spans, total length.....	34
9 spans, total length.....	49
12 spans, total length.....	65
6 spans, total length.....	33
8 spans, total length.....	45
10 spans, total length.....	55
21 spans, total length.....	122
11 spans, total length.....	61
12 spans, total length.....	66
8 spans, total length.....	43
8 spans, total length.....	44
6 spans, total length.....	35
13 spans, total over River Salado.....	71
6 spans, total length.....	35
5 spans, total length.....	33
13 spans, total length.....	72
10 spans, total length, River Mulato.....	55
12 spans, total length, River Marquez.....	67
15 spans, total length.....	84
17 spans, total length, River Sevaruyo.....	94
9 spans, total length.....	49
8 spans, total length, River Atocha.....	44
2 spans, total length, River Pazna.....	43
13 spans, total length, River Poopo.....	75

	Meters
14 spans, total length.....	33
10 spans, total length.....	55
7 spans, total length.....	39
Total.....	1,501

Rails.—Rails on the section between Ollague and Uyuni weigh 68.4 pounds to the yard and between Uyuni and Oruro, 60 pounds.

Ties.—Wood ties are used for 449 kilometers and steel ties for 74 kilometers.

Maintenance.—The line is kept in good condition.

VIACHA-LA PAZ (MAIN LINE) SECTION

Altitude.—There is not much variance in the altitude on this section. The highest point is at Kenko, where the altitude is 3,982 meters.

Gage.—The gage of this section is 1 meter.

Grades.—The maximum grade is one of 2.4 per cent.

Curves.—The radius of the sharpest curve on the section is 80 meters.

Bridges.—There is one 3-span bridge, 53 meters in length, on this section.

Rails.—Rails weighing 60 pounds to the yard are used.

Ties.—Ties on this section are of steel.

Tunnels.—There are two tunnels, with a total length of 680 feet on this section.

Maintenance.—The line is kept in good condition.

MOTIVE POWER AND ROLLING STOCK

The following table indicates both the 1-meter gage and 2-foot 6-inch gage motive power and rolling stock, as well as the floating stock, in operation at the end of the calendar years 1925, 1926, and 1927.

	2-foot 6-inch gage			Meter gage		
	1925	1926	1927	1925	1926	1927
LOCOMOTIVES						
Goods.....	93	93	88	12	12	27
Articulated.....	2	2	2	—	—	—
Shunting.....	23	22	15	2	3	10
Passenger.....	—	—	—	5	5	5
Total.....	118	117	105	19	20	42
COACHES						
First class.....	17	17	17	4	4	6
Second class.....	26	27	31	7	7	7
Composite.....	6	5	5	1	1	1
Sleeping.....	7	7	9	3	5	6
Dining.....	5	5	6	1	1	2
Kitchen.....	3	3	3	—	—	—
Service coaches.....	16	16	16	—	—	—
Caboose.....	—	—	—	2	2	2
Military vans.....	2	2	2	—	—	—
Baggage and mail.....	20	20	19	3	3	4
Parcel cars.....	2	2	2	—	—	—
Hospital coach.....	1	1	1	—	—	—
Provision vans.....	2	2	2	—	—	—
Total.....	107	107	113	21	23	28
MERCHANDISE AND SPECIAL SERVICE CARS						
Covered wagons.....	672	674	595	91	91	170
Service vans.....	45	40	40	—	—	—
Composite livestock and goods.....	46	46	41	—	—	5
Large wood high-sided wagons.....	120	110	110	—	—	—
Large steel high-sided wagons.....	939	939	828	—	—	111
Small wood high-sided wagons.....	102	98	95	—	—	—
Small nitrate wagons.....	10	5	5	—	—	—
Flat wagons.....	494	486	450	30	5	101
Explosive wagons.....	15	15	15	6	6	6
Water-tank wagons.....	48	48	44	—	—	8

	2-foot 6-inch gage			Meter gage		
	1925	1926	1927	1925	1926	1927
MERCHANDISE AND SPECIAL SERVICE CARS—contd.	Number	Number	Number	Number	Number	Number
Oil-tank wagons.....	274	274	249			25
Breakdown wagons.....	10	12	12			
Sand and rubbish wagons.....	2	3	3			
Traveling cranes.....	3	7	7			1
Snow plough.....	1	1	1			
Cattle wagons.....				2	2	2
Open goods wagons.....				40	40	40
Convertible wagons.....					25	25
Ballast cars.....				18	18	18
Tank cars.....				4	4	
Total.....	2,781	2,758	2,495	191	191	512
FLOATING STOCK						
Tugs.....	6	6	5			
Steam launch.....	1	1	1			
Open lighters.....	79	73	77			
Steel lighters.....	34	23	23			
Small boats.....	9	9	9			
Scows.....	11	10	5			
Total.....	140	122	120			

THE BOLIVIA RAILWAY CO.

In May, 1906, a contract was signed between the Bolivian Government and the National City Bank and Speyer & Co. of New York City to provide for the construction and operation of railway lines in Bolivia. These companies had been given a concession by the Bolivian Government, dated May 22, 1906, for the above-mentioned purpose. Accordingly, the two companies promoted the organization of a separate company known as the Bolivian Railway Co. which was to construct and operate railway lines in Bolivia. The company was incorporated under the laws of Connecticut on February 18, 1907, and had assigned to it the above concession.

Under the terms of this concession the railway company was granted the right to import free of duty, all material necessary for constructing and operating railway lines during a period of 30 years. Similarly, it was agreed that the company should appropriate £3,000,000, to which the Government should add £2,500,000, making a total of £5,500,000 available, with which to commence construction. In order to obtain this money, the company issued £3,750,000, 5 per cent, series A first-mortgage bonds, due January 1, 1927, and guaranteed by the Bolivian Government. This issue was purchased by the underwriters of the Bolivia Railway Co. at 80 per cent of its face value, netting £3,000,000. To this amount the Bolivian Government added £2,500,000 in cash, part of a fund paid to it by Brazil in accordance with the settlement of the Treaty of Petropolis, which the Government at this time had at its disposal. In return the Government received £2,500,000, 5 per cent second-mortgage, non-cumulative bonds, due January 1, 1932. In the meantime the Bolivian Railway Co. leased certain of its rights under the concession which it had obtained from the Bolivian Government, to the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), for a period of 99 years from January 1, 1909. Under the lease, construction work was inaugurated on the Oruro to Viacha section in 1906 and completed in 1908, a distance of 207 kilometers. Work on the Rio Mulato to Potosi section was commenced in 1909 and completed in 1912, 174

kilometers. The Viacha to La Paz section, 32 kilometers in length, was commenced in 1910 and finished in 1917.

This line was reconstructed by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), so it is now directly owned by that company. The Uyuni to Atocha branch, 90 kilometers in length, was begun in 1911 and finished in 1913. At Atocha, the line connects with the Atocha-Villazon Railway which offers through communication to the Argentine frontier and by means of the north central railway in Argentina to practically any point in that country. This section is Government owned, and operated at the present time by Dates and Hunt, although efforts have been made by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.) to lease it. For details regarding this line, see "Railways of South America, Part II" section 1 on Bolivia. The Oruro to Cochabamba section, 205 kilometers in length, was commenced in 1909 and finished in 1917.

In the meantime Bolivia had issued a Series "B," first-mortgage loan for £2,000,000 at a price of 60 per cent. This loan was permitted under the terms of the original contract but was not guaranteed as to interest by the Government. In 1927 when the series A first-mortgage bonds were due, fear was expressed by the Bolivian Government that these bonds would be foreclosed by the bondholders and the property sold. At that time there was outstanding £5,750,000 series A and B, first-mortgage bonds, £2,500,000 second-mortgage bonds, and \$10,000,000 shares of capital stock, with a par value of \$100 each. Of the first-mortgage bonds £2,102,400 of series A and £1,940,000 of series B, aggregating £4,042,400, as well as the entire capital stock of \$10,000,000, were held by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.). Twenty-five per cent of the capital stock had been purchased with £60,000 of issue B bonds and 75 per cent for £200,000 cash. The remaining £1,707,600 first-mortgage bonds, were held by Belgian, French, and American interests. Of this amount £150,000 was held in the United States.

In view of reports to the effect that the first-mortgage bonds were to be foreclosed by the bondholders, the Government on June 29, 1927, issued a decree for the "Expropriation" of the properties. A copy of this decree follows:

Whereas, from investigations ordered and proof obtained, there is evidence that the Bolivia Railway Co., proprietor of the railway lines built in carrying out the contract law of May 22, 1906, owes heavy matured obligations which can not be canceled, and moreover the company is delinquent in the payment of other financial obligations contracted for the construction of said lines;

Whereas, the Republic has invested a considerable sum in acquiring bonds of said company, and has spent other likewise important amounts for paying interest on the preferential obligations of the same for the past 20 years;

Whereas, in the company's notoriously precarious condition, the forced liquidation of the company can bring about serious disturbances for the country, jeopardizing the regularity of its rail communications, the normal maintenance of which is a matter of public order;

Whereas, the railways now constructed constitute an essential factor, politically and economically, in the development of the country, it being necessary that their future management should respond efficiently to the demands of national interests; and whereas it is the duty of the Executive power to keep watch over and guarantee the legitimate rights of creditors of property of the Bolivia Railway Co., and likewise to assure the return of the capital invested by the Bolivian Government;

Whereas, the condition of the Bolivia Railway Co. imposes upon the Republic the duty of making the necessary efforts for acquiring definite proprietorship over the said lines, paying the price which they justly represent, so as to prevent

a forced liquidation of the company from causing greater injury to the said creditors, to the nation, and even to the credit of the Republic;

With the approval of the council of ministers, in conformity with article 13, of the political constitution of the State, and making use of the power accorded to the Government by article 13 of the general railroad law (*ley general de ferrocarriles*) ratified and made concrete by the provisions of a special law now in force;

Be it decreed—

Article —.—It is declared necessary and expedient to expropriate the railways which have been constructed by the Bolivia Railway Co. in the national territory under the contract of May 22, 1906, said expropriation being understood to include all the materials, supplies, and fixtures of the said lines, as also their equipment, shops, and dependencies.

Article —.—By the present decree the legal representative of the Bolivia Railway Co. is notified and the creditors of the company referred to are informed; so that through their legal authorized agents within the country they may intervene in the estimated valuation of the lines to be expropriated and receive the corresponding payment, in keeping with the proceedings laid down in the law of expropriations.

The Ministers of Finance (Hacienda) and Public Works (Fomento) are charged with the execution of the present decree.

Given in the city of La Paz, June 29, 1927.

H. SILES,
C. DIEZ DE MEDINA,
F. VACA CHAVEZ.

In view of this situation, a commission was appointed to consult with the Bolivian Government. This commission was composed of A. W. Bolden of London, chairman of the board of directors of the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), representing the majority holders; A. E. Heskett, general manager of the Bolivian Railway Co.; and Huntington Adams of New York representing the minority holders. The Government appointed a committee to confer with the commission which consisted of the Ministers of Public Works and Communication, Minister of Finance, and José Mendieta, Carlos Diez de Medina, and Carlos Lejada. The commission and the Government committee reached an agreement on January 1, 1928, under the terms of which the first-mortgage bonds of £5,750,000 were renewed, and will be replaced by a similar issue, at 5 per cent nonaccumulative, depending on the railway's income. The new bond issue will be allocated in two series, series A, of £1,707,600 to the minority stockholders, and series B, of £4,042,400 to the majority holders. Series A will be retired through an assignment at not less than £10,000 per annum, but primarily based on 5 per cent of the annual income of the Bolivian Railway Co. The Bolivian Government is given 27,000 shares of the 100,000 shares of capital stock now owned by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), in exchange for £419,332 of the original second-mortgage bonds held by the Government. These bonds are to be retired by the railway company. This, then, was the status of the Bolivian Railway Co. on May 1, 1928. A translation of this agreement follows:

TRANSLATION OF THE AGREEMENT DATED JANUARY 21, 1928, MADE BETWEEN THE GOVERNMENT OF BOLIVIA AND THE COMMISSION REPRESENTING THE FIRST-MORTGAGE BONDHOLDERS

LA PAZ, *January 21, 1928.*

Having seen, in cabinet council, the contract law of November 27, 1906, as a result of which the system of railway lines belonging to the Bolivia Railway Co. was constructed and is being operated, the legal report of the special commission charged with the study of the question, the conclusions to which the representatives of the Government have arrived and of the other interested parties, and all

the documents, antecedents, and papers which have resulted from these studies; and

Considering that the conditions of the contract law of November 27, 1906, impose on the Bolivia Railway Co. the obligation of repaying on January 1, 1927, the total of the first-mortgage bonds issued for the construction of the lines and which amount to a total of £5,750,000.

That, in accordance with these conditions and others contained in the first-mortgage contract and trust deed, the failure to pay off these first-mortgage bonds at their maturity brings about the default and authorizes the trustees to take possession of the railway lines and all and any other property of the company, and to take whatever measures he may consider convenient for safeguarding the interests and rights of the holders of the first-mortgage bonds, without leaving out of account the right to order the public auction and consequent transfer of the railways.

That, the difficult financial position of the Bolivia Railway Co. being well known, which makes it impossible for it to comply with its obligations to the holders of the first-mortgage bonds, as is shown by its balance sheets and other documents appertaining thereto, the National Congress, with the desire to guard against the possibilities contemplated in the previous clause, which would have resulted in the complete and final loss of the capital which the nation has invested in the second-mortgage bonds and in the payment of the guaranty of interest on the first-mortgage bonds, gave full authorization to the executive power, by means of the law of March 31, 1926, to settle the results of the railway contract of November 27, 1906, in harmony with the general interests,

That, availing itself of that authorization and taking into account the proposals presented on March 17, 1926, by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), lessee of the railways and present holder of the majority of the first-mortgage bonds, the supreme Government formed a commission composed of Messrs. E. Valasco y Galvarro, C. Tejada S., and B. Gallardo, to study this delicate question and to make reports and suggestions for the purpose of indicating a sound solution and adoption of efficient measures to protect the interests of the state and the various parties concerned,

That the commission thus empowered, after a careful study of the matter, arrived at conclusions which show:

That the only party which is responsible for the payment of the bonds is the Bolivia Railway Co.; that this company finding itself unable to repay the first-mortgage bonds at their maturity, much less could it pay the second-mortgage bonds which belong to the Government; that the repayment of the sums provided for the service of the guaranty of the interest of the first-mortgage bonds "results entirely remote and eventual," since "the Government have no preference or privilege of any kind whatever over the creditors of the first mortgage so that its guaranty of interest should be returned out of the profits of the railways," and that, in this situation, the Government's course was to seek an agreement with the first-mortgage bondholders,

That, in view of these conclusions which make apparent the immediate danger of the loss of all the capital invested by the Republic in the railway system of the Bolivia Railway Co., and even the loss of the mere expectancy of recovering them some day, preliminary efforts were proceeded with, with a view to arriving at the bases of an equitable agreement, and once all the data and information on the question had been collated, the delegation of the Antofagasta & Bolivia Railway Co. (Ltd.), The Bolivia Railway Co., and the first-mortgage bondholders, established itself in this city, consisting of A. W. Bolden, A. E. Haskett, and Huntington Adams, and commenced at once the study of the matter in conjunction with the commissioners of the Government, José Mendieta, Carlos Tejada Sorzano, Carlos Diez de Medina, and Benjamin H. Gallardo, assisted by the Ministers of Public Works and Finance;

That, as the result of this study and of the conference held between the two commissions, definite bases have been formulated which, in the opinion of the Government, are in harmony with the general interests and contemplate the reciprocal rights in a spirit of high equity, in view of the situation which has been created by the contract of 1906, since the investments of the Republic in second-mortgage bonds and guaranty of interest, which amount to the considerable sum of £4,647,581 16s. 5d. which, if the said contract was fulfilled in all its legal consequences, would result in an absolute loss for the Republic, to-day are safeguarded as a result of these agreements, which secure their repayment in unmistakable form, although at a distant date, by means of the conversion of second-mortgage bonds into first-mortgage bonds, exchange of second-mortgage bonds for the ordinary shares of the company, and accumulative

amortization, for the purpose of which a new distribution of the income of the company is established, guaranteeing this result and giving first place to the contributions and payments which are to be made for that purpose;

That the new first-mortgage bonds to be issued according to this agreement will not be accumulative as were the original ones, which signifies a highly important alteration in the obligations of the company, and the issue will only be made in quantity sufficient to substitute the same amount of £5,750,000, excluding the amount which it was proposed to issue to cover the advances made by the Antofagasta & Bolivia Railway Co. (Ltd.) in the construction of the lines, and to complete some of them which are yet unfinished; the new issue is to be made in two series: Series A for the holders in minority of the first-mortgage bonds, £1,707,600, and series B for the Antofagasta & Bolivia Railway Co. (Ltd.) who are the present holders of the majority of the said bonds for £4,042,400;

That the first-mortgage bonds of the series A £1,707,600 will be gradually retired from circulation, assigning for that purpose 5 per cent of the income of the railways, which fund for retirement in no case may be less than £10,000 per annum, which will be increased with the corresponding interest on the bonds that will have been retired, in order that the operation may be realized in as short a time as possible, so that once the whole of the bonds have been retired they may be handed over to the Government in exchange for its second-mortgage bonds of an equal amount of £1,707,600;

That the balance of the original second-mortgage bonds which amounts to the sum of £792,400 will be totally covered in this manner: £419,332 in ordinary shares of the Bolivia Railway Co., which will be transferred by the Antofagasta & Bolivia Railway Co. (Ltd.), for a nominal value of \$2,700,000 American gold, which represents 27 per cent of the capital stock of the company; and £373,068, which will be canceled as a set-off against an equal sum which the Antofagasta & Bolivia Railway Co. (Ltd.) has invested in construction work and agrees on its part to cancel;

That, with the intention to further assist in reducing the obligations of the Bolivia Railway Co., the Antofagasta & Bolivia Railway Co. (Ltd.), also agrees to the cancellation and incineration of the second-mortgage bonds of the original issue which the Government of Bolivia delivers in exchange for the 27,000 ordinary shares, which are to be transferred to it;

That the exchange of the second-mortgage bonds for shares of the company is in every way suitable to the interests of the Republic, not only owing to the secondary position of the said bonds but also because of the prospects which the shares offer for the future, and more especially because in this way the Republic acquires ownership and more efficient representation in the company in order to further its development in the permanent interests of the Republic;

That clause 27 of the contract law of November 27, 1906, disposes that the disbursements of the Government for the service of the guaranty of interest on the first-mortgage bonds will be reimbursed by means of a percentage of the net profits of the company only to commence from the year 1937 and always provided that all its obligations have been met, a circumstance which makes nugatory such reimbursement because the obligations of the company can not be met in view of its financial position.

That, notwithstanding this circumstance, it has been possible to secure the assurance of the reimbursement by means of the creation of a special amortization fund which will start accumulating from the year 1927, that is to say, 10 years earlier than the date provided for by the contract and the said fund will be provided by means of an annual contribution of a preferential character taken from the earnings of the railways;

That, with the intention that the annual contributions of the railways assigned to the retirement of the first-mortgage bonds of series A and the payments which are made to the fund for the reimbursement of the guaranties of interest, should be guaranteed and increased progressively reaching the corresponding maximum in the shortest possible time, it is agreed that these funds will be managed by a responsible foreign financial institution, employing financial measures for accumulation;

That the first-mortgage bonds corresponding to series A will be registered in the name of the Government of Bolivia as and when the trustee acquires them, but are to remain in the possession of the trustee until such time as the retirement of the whole of these bonds to the amount of £1,707,600 has been realized, to be handed to the Government only then, and in exchange for second-mortgage bonds of the new issue, so that the trustee may continue to receive the interest on the bonds retired from time to time and proceed more effectively in the opera-

tion of increasing the funds and expediting the retirement of the bonds of series A;

That once all the aforesaid first-mortgage bonds corresponding to series A have been retired, the 5 per cent of the income of the company assigned to this purpose will be applied to the fund for the reimbursement of the sums disbursed by the Government in the service of the guaranty of interest, in substitution of the one-fifth of 1 per cent, which forthwith commences to form the reimbursement fund; and this fund also will be administered by the trustee with accumulative measures to produce the highest returns in order to increase it progressively and reach a total of £2,147,581 16s. 5d. within the period calculated approximately;

That instead of the Bolivia Railway Co. contracting further compromises and obligations to attend to the completion and development of its lines, it is suitable to create for this purpose a "supplementary capital fund," formed by contributions from the income of the railways, such contributions having been fixed at £10,000 per annum, until the maximum for this fund is reached, up to a limit of £100,000;

That in the new general distribution of the income of the company, all the requirements previously noted have been taken into consideration and preference has been given over the remaining obligations of the company, to the "supplementary capital fund," and to the contributions assigned to the acquisition of the first-mortgage bonds of series A which are to be handed to the Government of Bolivia, as also to the sum for the formation of the reimbursement fund to be handed to the same Government, leaving authority to the directorate to arrange for the distribution of any excess which might result from the income, as is the universal practice with companies of this kind;

That, in order to avoid erroneous interpretations in view of the necessity to facilitate the installation of hydroelectric plants, and the use of waterfalls and streams, it is advisable to clarify the effects of the privilege given to the Bolivia Railway Co. by clause 22, subsection (e) of the contract law of 1905, leaving on record that this privilege only refers to the use of fiscal waters for the service of locomotives, engines, and other such subsidiary plants of the railways;

That the right given to the concessionaries by subsection (1) of the same clause 22 of the contract of 1906, to "acquire up to 1,000 square leagues of fiscal lands, situated in any part of the Republic," was not of an indefinite character, and although this time limit has been extended up to the present, the Government feels it necessary to annul the said right;

That the representation of the Government in the principal directorate of the company and the salary of its representative are explicitly established by clause 28 of the contract law of November 27, 1906, it being unnecessary to make any other disposition on this point;

That the intervention of the Government in the management of the company and consequently in the care of the country's interests will be more efficient and effective because of the creation of a local committee in which the Government will have its own representative, this committee being entrusted with the study and determination of the most important questions relating to the principal policies of the administration of the company in accord with the decisions of the directorate;

That in order to give greater authority and make more binding the decision of the general meetings of shareholders on certain points of great importance for the life and future of the company, the Antofagasta & Bolivia Railway Co. (Ltd.) contracts and promises to negotiate the modification of the statutes of the Bolivia Railway Co. in order that, so long as the Government of Bolivia retains in its possession 27 per cent of the ordinary capital, the decisions of the general meetings will be taken in such cases by a majority of three-fourths of the shares represented therein, this modification being effectively assured from the present, since that company is the principal shareholder of the company whose statutes are to be modified;

That, since the State acquires the position of shareholder in the railways, it is necessary that the documents, which prove the condition of the business, and the details and amount of the property of the company, are in the respective Government offices, duly registered and authorized, and to do this the balance sheets of the Bolivia Railway Co. for 1926 and 1927 will be protocolized in the public notary's office, and the inventories will be delivered to the Minister of Public Works;

That, for the same reason, in virtue of the negotiations carried out for this purpose and in accord with the provision established by clause 18 of the lease contract of the railways of December 31, 1908, it has been agreed between the

Bolivia Railway Co. and the Antofagasta & Bolivia Railway Co. (Ltd.) to modify clause 8, subsection (h) of the said contract, with a view to the adoption of an administrative policy to facilitate the complete development of the operation of the lines, in harmony with the actual conditions of the lines and means of transport of the Republic, and to eliminate any restriction with regard to the direction of the traffic of the company, and it is also agreed, in order that the service of interest on the bonds of the company may be attended with better dispatch, that the rentals shall be liquidated every six months, namely, on March 15 and September 15 of each year;

That the Antofagasta & Bolivia Railway Co. (Ltd.) lessee of the lines of the Bolivia Railway Co., also promise to study, as soon as the local committee is formed, the uniformity of tariffs and classifications and the division of the tariffs arising from the interchange of traffic between the lines of that company and those of the Bolivia Railway Co. in proportion to the working expenses and not according to the kilometric distances run, thus adopting a policy of distribution which, in the opinion of the technical departments and the special commissioners of the Government, is absolutely justified and should increase the returns of the Bolivia Railway Co. to the general benefit;

That, notwithstanding, according to clause 4 of the lease contract, the rentals of the lines of the Bolivia Railway Co. are to be gradually increased until they reach a maximum of 40 per cent of the gross receipts after a period of time which has not yet been reached, the Antofagasta & Bolivia Railway Co. (Ltd.), in its position as lessee, also undertakes to increase those rentals to the indicated maximum of 40 per cent, commencing from the beginning of the financial year 1927, inclusive, thus considerably increasing the gross income of the company;

That, as the interests of the Republic in the company will now become of a permanent nature in its dual character of creditor and shareholder, the duties of the fiscal inspector become of more use, since they will continue to be developed as at present, and in addition will assist the action of the Government representative in the local committee by providing him with the necessary information;

That the questions arising from previous contracts in connection with the supplementary capital fund, payment of the balance of rentals, verification of exchange differences, possible return of taxes collected by the United States Treasury, and any others which have not yet been definitely solved, will be the subject of separate and independent agreements and resolutions to be given in a short time, according to the rights and interests which it is necessary to review in each case;

That the formation of the local committee, the issue of new bonds, the transfer and handing over of shares to the Government, and the rest of the agreements stipulated in this resolution, require certain formalities, acceptances, and ratifications, on the part of the entities concerned in the management of the interested companies, all of which will be properly complied with in due course, and to this effect the Government of Bolivia, the Bolivia Railway Co., and the Antofagasta & Bolivia Railway Co. (Ltd.) will take the necessary steps in the shortest time possible;

That, in the present resolution, all the suggestions which have been received by the Government from its special commissioners have been thoroughly taken into account, and in view of the legal position, arising from the contract law of November 27, 1906, the Government considers that there was no reason to hope, and leaves on record that it has not been possible to obtain, more favorable terms of settlement than those laid down in the clauses of this resolution which efficiently guarantee the reimbursement of the investments of the Republic and the effective representation of the Government in the management of the lines of the Bolivia Railway Co.;

That, finally, Messrs. Bolden, Heskett, and Adams, who intervene in the exercise of general powers, and previous authorizations of the interested parties, and the first-mortgage bondholders, will obtain before December 31, 1928, the corresponding ratifications, to the satisfaction of the Bolivian Government, not only of the directorates, but also of the general meetings of the companies, of the first-mortgage bondholders, and of the trustees; it should be left on record that Mr. Bolden intervenes in exercise of the full powers which he holds as managing director of the Antofagasta & Bolivia Railway Co. (Ltd.) and also as representative of the first-mortgage bondholders;

Consequently, and in use of the ample authorization conferred by article 3 of the law of March 31, 1926, the Executive power in cabinet council,

Resolves:

The results of the contract law of November 27, 1906, are settled in accordance with the following clauses:

One.—Commencing with January 1, 1927, on which date the first-mortgage bonds of the Bolivia Railway Co. at present in circulation and which amount to £5,759,000 should have been canceled, the said bonds are renewed and will be replaced by means of a new issue which will be made for the same amount under the following conditions—

(a) The bonds will be first-mortgage bonds with noncumulative interest of 5 per cent per annum, and the interest will depend exclusively on the income of the railways.

(b) The maturity date will be 40 years, which may be renewed in accordance with clause 6 of the contract law of 1906.

(c) The issue of these bonds will be made in two series: Series A for the present holders of the first-mortgage bonds in minority, for £1,707,600, and series B for the Antofagasta & Bolivia Railway Co. (Ltd.), which is the present holder of the first-mortgage bonds in majority, for £4,042,400.

Two.—The bonds of series A for £1,707,600 will be retired from circulation by their purchase which will be made with the means assigned for that purpose by clause 3 and for the objects which that clause points out.

Three.—From the income of the Bolivia Railway Co. there will be assigned a sum equal to 5 per cent of such income and which must not be less than £10,000 per annum, for the purpose of retiring from circulation the first-mortgage bonds of the series A for £1,707,600. The bonds which are thus retired from circulation will continue to receive interest which will be applied to augment the retirement fund. Once all the first-mortgage bonds of the series A for £1,707,600 have been retired from circulation, they will be handed to the Bolivian Government in exchange for an equal quantity of second-mortgage bonds which will be canceled and incinerated. As and when the first-mortgage bonds of the series A are acquired, they will be retired from circulation and officially registered in the name of the Bolivian Government, but remaining in possession of the trustee until such time as the whole quantity of the bonds of the said series has been retired from circulation.

Four.—The Government of Bolivia disposes of the original and second-mortgage bonds, to the value of £2,500,000, in the following manner:

(a) The Government will retain the sum of £1,707,600 second-mortgage bonds of the new issue which will have the following conditions: Maturity date of 45 years, renewable, noncumulative interest of 5 per cent per annum, and they will be exchangeable for first-mortgage bonds as specified in the previous clause; and the second-mortgage bonds of the original issue for an equal sum of £1,707,600 are to be canceled and incinerated.

(b) The nominal amount of £419,332 second-mortgage bonds of the original issue will be invested in the acquisition, by means of exchange of 27,000 shares of the Bolivia Railway Co., or 27 per cent of the capital stock of the said company, which will be transferred by the Antofagasta & Bolivia Railway Co. (Ltd.), being a nominal value of \$2,700,000 American gold.

(c) The balance of the second-mortgage bonds, which is £373,068, is compensated with an equal amount which the Bolivia Railway Co. owes to the Antofagasta & Bolivia Railway Co. (Ltd.) for advances and commitments in the construction of the company's lines, both sums being canceled and the corresponding bonds incinerated.

Five.—The Antofagasta & Bolivia Railway Co. (Ltd.), with the object of further reducing the obligations of the Bolivia Railway Co., declares canceled the said credit for £373,068, and also declares canceled the second-mortgage bonds of the original issue amounting to £419,332, which the Bolivian Government is to deliver in exchange for the 27,000 shares of the Bolivia Railway Co., which the Antofagasta & Bolivia Railway Co. (Ltd.) will transfer; these bonds will also be incinerated.

Six.—Clause 27 of the contract law of November 27, 1906, is modified in the following terms: With the view of amortizing and reimbursing the Bolivian Government the amount which it has disbursed during the first 20 years of the said contract in serving the guaranty of interest on the first-mortgage bonds, which at the present date amounts to £2,147,581 16s. 5d., a fund will be created for this special purpose by means of an annual contribution from the income of the company equal to one-fifth of 1 per cent of the amount specified, that is to say, a fixed sum of £4,295 3s. 3d. per annum. This contribution will be raised to one-fourth of 1 per cent should an increase in passenger fares be authorized in the proportion of 15 per cent for first-class fares and 5 per cent for second class, this additional contribution remaining in force only so long as the increase in

tariffs remains in force, and this contribution will cease as soon as the bonds of series A are all retired from circulation for delivery to the Government, when the 5 per cent of the income assigned by clause 3 to the retirement of the minority bonds will be applied to the amortization and reimbursement of the guaranty fund of interest, thus replacing the special contribution of one-fifth or one-fourth of 1 per cent as provided in the present clause.

Seven.—The annual contribution of 5 per cent of the income of the company, with a minimum of £10,000, corresponding to the year 1927, assigned to the retirement of the minority holding of first-mortgage bonds, as also the payment of one-fifth of 1 per cent of the amount of the fund for guaranty of interest, or the sum of £4,295 3s. 3d. corresponding to the year 1927, assigned to the amortization of said fund, will be paid over at once without waiting for the ratification of the contract, and as such will be considered as a guaranty of execution, becoming the property of the Government if the ratification is not effected.

Eight.—For the termination and development of the railways, a supplementary capital fund will be created by an annual contribution of £10,000 to be taken from the income of the company until a maximum of £100,000 is reached. This sum will be disposable, to be used for extensions, betterments, or other necessities of the lines, and the annual contributions will be suspended while the total of the fund is in excess of £60,000, but the contributions are to be renewed in order to complete the maximum sum should this supplementary capital fund fall below the figure of £60,000. The investment of these funds in the purposes which are stipulated in this clause will be made in accord with the decisions of the local committee which will be created in Bolivia, taking into account the requirements for the development of the railways.

Nine.—A trustee will be appointed abroad, to the satisfaction of the Government and the company, by means of a special contract, to perform all the operations referred to in clauses 3 and 6, and more especially for the collection of the quotas destined to the retirement of the first-mortgage bonds of series A and their investment, as also in the management and investment of the funds which are assigned to reimburse to the Bolivian Government the sums which it advanced in the service of the guaranty of interest of the first-mortgage bonds. The trustee is also specially authorized to carry out the acquirement of the first-mortgage bonds of series A and retire them from circulation as and when favorable opportunities present themselves and in accord with the stipulations which will be made in the trust contract. Also, he will be authorized so that if, at the end of any one year, it has not been possible to acquire the said bonds in open market below par, he may proceed to acquire bonds at par by means of drawings. In the management and investment of the funds, the trustee will use accumulative methods, the most secure and remunerative, and once the sum of £2,147,581 16s. 5d. has been accumulated, or the period of 67 years has lapsed, which has been calculated approximately as the period over which the payments assigned for the reimbursement of the said guaranty are to be made, he will place the said sum at the disposition of the Bolivian Government. In the trust contract the necessary provisions will be made for cases where bonds have been lost, destroyed, or otherwise have disappeared.

Ten.—In view of this resolution and the relative agreements, clause 10 of the contract law of November 27, 1906, is modified in the following terms: The net profits of the railways of the Bolivia Railway Co. will be distributed and applied yearly in the following order—

(a) £10,000 for the supplementary capital fund.

(b) Five per cent, with a minimum of £10,000 per annum, for the purchase and retirement of the first-mortgage bonds of the series A.

(c) One-fifth of 1 per cent of the amount paid for the guaranty of interest on the first-mortgage bonds, under the conditions specified in clauses 6 and 9, for the service of amortization and reimbursement of the sum paid.

(d) In the payment of interest on all the first-mortgage bonds, up to 5 per cent per annum.

(e) In the payment of interest on the second-mortgage bonds which may be in circulation, up to 5 per cent per annum.

(f) Any balance will be distributed in dividends on the shares, in contributions to reserve funds, or other appropriations, as the directorate of the company may decide.

Eleven.—The Government of Bolivia, in addition to its special attributes of a general character, and those which the contract law of November 27, 1906, confers, will have the intervention in the company to which its position as shareholder in the Bolivia Railway Co. gives right, which position is acquired in virtue of these agreements. Also, in order that this intervention may be made efficient

and close, a local committee will be created, whose duties will be specified by the directorate of the company. The said committee will reside in La Paz and will be composed of three members, two of whom will be elected by the directorate of the company and one by the Government; said committee will intervene in determining the services to be established on the railways and in the study of tariffs and the principal conditions of the operations of the lines, always being subject, however, to the decisions of the directorate. The local committee will be expressly acknowledged by the lessee, the Antofagasta & Bolivia Railway Co. (Ltd.).

Twelve.—The Antofagasta & Bolivia Railway Co. (Ltd.), as principal shareholder of the Bolivia Railway Co., undertakes to obtain the reform of the statutes of the latter company, of which the Government of Bolivia forms part with 27 per cent of the capital stock, in the sense that in the general meetings of shareholders, a majority of three-fourths of the shares represented at the meetings will be required to pass resolutions on the following matters:

- (a) Increase of capital.
- (b) Total or partial transfer of the property of the company.
- (c) Creation of new mortgage obligations.
- (d) Extension or radical changes in the lines, except as is established in clause 8.
- (e) Operation contracts or rental of other lines, which are not of a temporary nature.

The reform of the statutes which should be obtained according to the present clause will be subject to and will continue only so long as the Government of Bolivia maintains in its possession the 27,000 shares, or 27 per cent of the ordinary capital of the railway company which it acquires in virtue of these agreements.

Thirteen.—As a result of the efforts of the Government and in accord with clause 18 of the lease contract of December 31, 1908, the Bolivia Railway Co. and the Antofagasta & Bolivia Railway Co. (Ltd.) agree to modify clause 8, subsection (h) of the said contract, in the sense that the lines will be operated and worked by the lessee in a manner to obtain the best result for their own development in benefit of the country and the company, without considering Antofagasta and Majillones as the recognized ports for the importation and exportation of the traffic handled by the lines of the company. They agree also that the rentals shall be liquidated every six months on March 15 and September 15 following the end of each six months. Also the Antofagasta & Bolivia Railway Co. (Ltd.) promises to study in conjunction with the Bolivian Government, as soon as the local committee shall be formed, a system for the uniformity of tariffs and classifications, as also the distribution of freights arising from the interchange of traffic between the lines of both companies in proportion to the working expenses and not in direct proportion to kilometers traveled, referred to in subsection (i) of the eighth clause of the lease contract. Also it is agreed that, commencing with the financial year 1927, the lessee will pay the maximum rate of rental of 40 per cent of the gross receipts of all the lines of the Bolivia Railway Co.

Fourteen.—It is understood that the privilege to "take gratuitously for the service of the railways all waters of public dominion," given to the Bolivia Railway Co. by clause 22, subsection (e) of the contract law of November 27, 1906, only refers to the use of waters that the said company requires for its locomotives, engines, workshops, offices, and employees' and workmen's houses.

Fifteen.—The rights conferred on the Bolivia Railway Co. by subsection (1) of the said clause 22 of the contract law of November 27, 1906, to "acquire up to 1,000 square leagues of land of fiscal ownership," are declared canceled, and, in consequence, the said clause is suppressed and the corresponding concession annulled.

Sixteen.—The balance sheets of the Bolivia Railway Co. for the years 1926 and 1927, duly authenticated, will be protocolized in the public notary's office, and the inventories of the properties and stocks of the said company will be archived in the Ministry of Public Works.

Seventeen.—As long as the Government considers it advisable it will maintain the fiscal inspection specified in clause 28 of the contract law of November 27, 1906.

Eighteen.—The subjects of previous negotiations which have not yet been settled, regarding the balance of the supplementary capital fund, rentals of the lines, verification of exchange differences, possible return of taxes collected by the United States Treasury, and any others which may at present be pending, will be the subject of separate and independent agreements.

Nineteen.—The corresponding public document will be executed, intervening in representation of the Government and Government attorney, the director of the National Treasury, and the chief officers of the Ministries of Public Works and Finance, and in representation of the Antofagasta & Bolivia Railway Co.

(Ltd.), the Bolivia Railway Co., and the first-mortgage bondholders, A. W. Bolden, A. E. Heskett, and Huntington Adams, who will obtain the acceptances and ratifications which may be necessary; new first-mortgage and second-mortgage bonds will be issued under the conditions and for the amounts previously set out, in substitution for the original bonds which will be canceled and incinerated; the transfer of shares of the company to the Government will be carried out and all the requirements and formalities necessary will be fulfilled in order that the modifications agreed upon may be loyally and exactly complied with in all their parts. The responsibility, in case the ratifications are not obtained, will be that specified in clause 7 of this agreement.

To be registered and, with the acceptances of the Antofagasta & Bolivia Railway Co. (Ltd.) and the Bolivia Railway Co. and the first-mortgage bondholders, to be sent to the notary of finance, in order that the corresponding public document may be executed.

(Signed.)

SILES, C. ROMERO, L. M. LOZA, T. ML. ELLO, J.
MINOR GAINSBORG, F. GUZMAN, FELIX A DEL
GRANADO.

OPERATING OFFICIALS AND PURCHASES

The operating officials are the same as for the Antofagasta & Bolivia Railway, shown on page 117. Purchases, except those of a minor character, are made through the London offices of the Antofagasta & Bolivia Railway.

RIGHT-OF-WAY CHARACTERISTICS

The data pertaining to the right of way are divided into four sections. These four sections include only those actually owned by the Bolivia Railway Co.

UYUNI TO ATOCHA (TUPIZA) SECTION

Altitude.—The highest point on this section is found at a point about 9 kilometers north of Cordas, where the elevation is 3,952 meters above sea level.

Gage.—The gage of this section is 1 meter.

Grades.—The maximum grade on the section is 3 per cent.

Curves.—The smallest curve on this section has a radius of 76 meters.

Bridges.—There are eight bridges with a total length of 349 meters. These bridges are as follows:

	Meters		Meters
10 spans -----	34	7 spans -----	33
9 spans -----	31	15 spans -----	74
7 spans -----	34	10 spans -----	49
2 spans -----	42		
26 spans -----	52	Total -----	349

Rails.—Rails weighing 60 pounds to the yard are used.

Ties.—Steel ties are used.

Maintenance.—The line is kept in good condition.

RIO MULATO TO POTOSI SECTION

Altitude.—The highest point on this section is at Crucero Alto, which has an elevation of 4,787 meters above sea level.

Gage.—The gage of this section is 1 meter.

Grades.—The maximum gradient on this section is 3 per cent.

Curves.—The radius of the smallest curve is 76 meters.

Bridges.—There are no bridges of any importance on this section.

Rails.—Rails weighing 65 pounds to the yard are used.

Ties.—Steel ties, weighing 46 kilograms, are used.

Maintenance.—The line is kept in good condition.

ORURO TO COCHABAMBA SECTION

Altitude.—The highest point on this section is at Banderani, which has an elevation of 5,997 meters.

Gage.—The gage of this section is 1 meter.

Grades.—The maximum grade on this section is 7.6 per cent.

Curves.—The radius of the smallest curve on the section is 76 kilometers.

Bridges.—There are 15 bridges, having a total length of 1,170 meters. These bridges are as follows:

	Meters		Meters
5 spans.....	32	26 spans.....	130
6 spans.....	32	14 spans.....	70
4 spans.....	37	54 spans.....	270
3 spans.....	27	2 spans.....	61
1 span.....	19	2 spans.....	61
1 span.....	29	31 spans.....	155
1 span.....	29		
40 spans.....	199	Total length.....	1, 170
1 span.....	19		

Rails.—Rails weighing 60 and 65 pounds to the yard are used.

Ties.—Both wood and steel ties are used, in about equal proportions.

Tunnels.—There are five tunnels, with a total length of 988 feet, on this section.

Maintenance.—The line is kept in good condition.

ORURO TO VIACHA SECTION

Altitude.—The highest point on this section is at Calamarca, which has an altitude of 3,962 meters.

Grades.—The maximum grade on this section is 1 per cent, near Calamarca.

Curves.—The sharpest curve on the section has a radius of 143 meters.

Bridges.—There are six bridges, having a total length of 197 meters. These bridges are as follows:

	Meters
4 spans.....	37
1 span, over River Eucaliptus.....	30
6 spans.....	34
1 span, over River Aroma.....	36
1 span, over River Viscachani.....	30
1 span.....	30
Total.....	197

Rails.—Rails weighing 55 pounds to the yard are used.

Ties.—Ties on this section are made of wood.

Maintenance.—The line is kept in good condition.

FERROCARRIL CALETA COLOSO A AGUAS BLANCAS

(Aguas Blancas Railway; Ferrocarril de Aguas Blancas Caleta Coloso Railway)

The history of this railway dates from December 28, 1898, when the Caleta Coloso Railway was organized to construct a line running from Caleta Coloso to certain of the nitrate fields in that section. The railway was first opened to traffic in 1902. This company laid about 223 kilometers of track, extending from the port of Caleta Coloso to Aguas Blancas with various branches into the nitrate fields. In January, 1909, the Compañía Ferrocarril de Aguas Blancas was organized to acquire this company inclusive of all its equipment. It was capitalized at 30,000,000 pesos, all the stock of which is now held by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.). At the end of the calendar year 1926, the company had outstanding £665,504 first-mortgage debenture stock, which forms part of a total issue of £1,000,000 secured by a first mortgage on the property

due January 1, 1942. This issue is being curtailed by means of an accumulative sinking fund which became effective January 1, 1912. Both the debenture stock and interest are unconditionally guaranteed by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.). As of December 31, 1927, the company had 281.8 kilometers of track in operation.

OPERATING OFFICIALS AND PURCHASES

This line is operated by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), and all purchases are made through the purchasing office of that organization. The address of this company is Balmaceda 294, Casilla 614, Antofagasta, Chile.

TRAFFIC AND OPERATING RESULTS

The following table shows the freight traffic, passenger traffic, and operating results of the line for the calendar years 1918 to 1927, inclusive:

Year	Traffic ¹		Operating results ¹		
	Passengers carried	Freight carried	Operating revenue	Operating expenses	Net operating income
	<i>Number</i>	<i>Tons</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	69,194	315,266	10,799,046	6,754,920	4,044,126
1919.....	44,679	93,864	3,015,144	2,854,098	161,046
1920.....	67,119	273,854	10,917,513	6,315,234	4,602,279
1921.....	26,574	80,303	2,952,663	2,387,397	565,266
1922.....	13,871	104,433	3,710,865	1,926,396	1,784,469
1923.....	21,914	167,143	5,572,395	2,609,220	2,963,175
1924.....	39,679	245,530	7,106,187	6,076,575	1,029,612
1925.....	41,954	216,007	7,635,246	5,255,154	2,380,092
1926.....	32,489	172,366	6,234,485	5,031,917	1,202,565
1927.....	15,445	170,007	6,014,840	4,534,721	1,480,119

¹ Data from Estadística de los Ferrocarriles en Explotación.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The line runs from 7 meters above sea level at Caleta Coloso to 1,417 meters at Bonasort, the highest point.

Gage.—The gage of the line is 0.762 meters.

Grades.—The maximum upgrade is one of 3 per cent per 100 for a distance of 2,840 meters, while the maximum downgrade is one of 0.86 per cent for 500 meters.

Curves.—The radius of the sharpest curve on the line is 100 meters.

Fuel.—Both oil and coal are used for fuel. There is one coal station with a capacity of 2,000 tons and two oil stations. The distance between oil stations is 137 kilometers.

Water.—There are seven water stations with a capacity of 8,200 hectoliters. The average distance between stations is 37.9 kilometers.

Rails.—Steel rails weighing 18 kilograms to the meter, in sections of 7.6 to 9.1 meters in length, are used.

Ties.—Ties of roble pellin, 1.83 by 0.20 by 0.127 meters, spaced 1,430 to the kilometer, are used.

Small bridges and culverts.—There is one small bridge 1.5 meters in length and one 52 meters in length.

Tunnels.—There are no tunnels in use.

Employees.—During the calendar year 1927 the railway employed 288 men.

MOTIVE POWER AND ROLLING STOCK

For the calendar year ended December 31, 1927, the line had the following equipment in operation:

Locomotives.....	17	Freight cars:	
Passenger coaches:		Box cars.....	23
First class.....	1	Cattle cars.....	2
Second class.....	3	Gondola cars.....	398
Miscellaneous.....	5	Flat cars.....	67
Baggage cars.....	1	Special cars.....	26

CHILEAN NORTHERN RAILWAY CO. (LTD.)

(Ferrocarril Longitudinal Norte: Chilean Longitudinal Railway Construction Co.; and Chilean Railway Finance Co. (Ltd.)

The history of this line dates from October 25, 1909, when the Government granted a concession for its construction to the Chilean Railway Finance Co. Under reorganization plans the Chilean Longitudinal Railway Construction Co. was established and by decree No. 636 of April 20, 1910, had transferred to it the concession originally granted to the Chilean Railway Finance Co. Accordingly, construction work was commenced on the line extending from Pueblo Hundido, a station on the Chañaral Railway, to Pintados, near Iquique, a distance of about 713 kilometers. Under the terms of the concession it was provided that on delivery of each section of 60 kilometers of railway the Government should issue in favor of the railway company a "credito" guaranteeing the payment of interest at the rate of 5 per cent per annum and of a cumulative sinking fund of 2 per cent per annum, totaling 7 per cent per annum on the capital cost for each section completed. The cumulative sinking fund payments were to commence four years after each section was turned over to the Government and continue until the whole price of the section to which the "credito" represented had been paid. On December 31, 1925, there were outstanding £2,271,275 "creditos" of £3,055,750 "creditos" issued. On July 1, 1919, the operation of the line was taken over by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), which now operates it for the account of the Chilean Northern Railway Co. (Ltd.).

This line constitutes the first part of the Ferrocarril Longitudinal Norte, which when completed will extend from Pueblo Hundido to Arica. The second section from Pintados to Iquique (see section on Government Operated Railways) was placed in operation in January, 1929, under the direct administration of the Ministerio de Fomento, Sección Ferrocarriles. The first section had 713 kilometers of main line track in operation and 29 kilometers of sidings and branches at the end of the calendar year 1927.

The company also leases the Chañaral Railway, including the Los Pozos and Chulo branches, at an annual rental of 30,000 pesos. This system is 280 kilometers in length and of the same gage.

OPERATING OFFICIALS AND PURCHASES

The line at the present time is controlled by the Antofagasta (Chile) & Bolivia Railway Co. (Ltd.) and all purchases are made through the officials of that company.

The directors of the company are: Right Hon. Lord Lawrence of Kingsgange, chairman; A. W. Bolden; Hon. C. A. Campbell; Sir B. E. Greenwell, Bart.; R. J. Hose; Col. H. Le Roy Lewis; H. T. Tiarks. The secretary of the company, A. H. Clinch, may be addressed at 1 Broad Street Place, E. C. 2 London. The railway may be addressed at Bandera 275, Santiago, Chile.

FINANCES¹

Capitalization consists of £500,000 shares of £1 each, fully paid, issued (except seven signatories' shares) to construction company; authorized, £500,000; £1,830,950, 5 per cent first-mortgage debentures of £20, £100, and £500 (bearer, registerable as to principal only and reconvertible—fee, 2s. 6d. per debenture, either operation); outstanding balance of £3,055,750 sold on behalf of purchasers—£1,000,000 at 93 in December, 1911, £1,000,000 at 96 in July, 1912, £1,000,000 at 96 in May, 1913, and £55,750 subsequently; authorized, £3,055,750; interest payable June 30 and December 31; redeemable by 1940 out of sinking fund, above referred to (commenced 1915), applicable to drawings at par on one month's notice or to purchases at or below par; or (whole or part) at par on any interest date on one month's notice from company. Specifically secured on Chilean Government "creditos" for similar amount held by trustee, Royal Exchange Assurance. Price in official list, 96½. Due to working company, £182,981 at December 31, 1927, for loss on working and administration expenses from July 1, 1919.

OPERATING REVENUES AND EXPENSES¹

Year	Operating revenue	Operating expenses	Net operating loss	Year	Operating revenue	Operating expenses	Net operating loss
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	3,422,175	3,662,799	240,624	1923.....	4,227,213	4,609,416	382,203
1919.....	2,243,532	3,110,778	867,246	1924.....	3,993,831	4,088,385	124,554
1920.....	4,059,891	5,735,688	1,675,797	1925.....	4,077,560	4,157,741	80,181
1921.....	1,867,464	3,522,477	1,655,013	1926.....	4,426,510	4,495,961	69,451
1922.....	1,694,280	2,215,803	521,523	1927.....	3,401,394	3,562,596	161,401

¹ Data from Estadística de los Ferrocarriles en Explotación.

TRAFFIC

The following table indicates the passenger and freight traffic handled by the railway during the calendar years 1918 to 1927, inclusive:

Year	Passengers carried	Freight carried	Year	Passengers carried	Freight carried	Year	Passengers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1918.....	40,525	98,232	1922.....	17,159	43,870	1926.....	48,210	135,254
1919.....	28,452	48,454	1923.....	29,412	170,723	1927.....	35,099	101,810
1920.....	47,706	101,138	1924.....	35,658	148,925			
1921.....	26,856	46,140	1925.....	44,859	128,327			

NOTE.—Data from Estadística de los Ferrocarriles en Explotación.

¹ Stock Exchange Yearbook, 1929.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The railway runs from 802 meters above sea level at Qhillagua to Balmaceda, which is 2,416 meters and is the highest point on the line.

Gage.—The line is of 1 meter gage throughout.

Curves.—The radius of the smallest curve on the line is 100 meters.

Grades.—The principal upgrade is one of $2\frac{1}{2}$ per cent for 39 meters and the down grade is one of $2\frac{1}{2}$ per cent for 1,400 meters.

Fuel.—Both coal and oil are used for fuel. There is one coal station with a capacity of 2,500 tons and three oil stations with a capacity of 135 tons.

Water.—There are eight water stations with a total capacity of 7,250 hectoliters, located an average distance apart of 89.2 kilometers.

Rails.—Steel rails, 10 meters in length weighing 25 kilograms to the meter, are used.

Ties.—Ties of Oregon pine, 2 by 0.20 by 0.15 meters and roble pellin, 1.80 by 0.20 by 0.15 meters, spaced 1,500 to the kilometer, are used.

Culverts and small bridges.—There are 87 culverts and small bridges, having a total length of 103 meters.

Large bridges.—There is one large bridge 38 meters in length.

Tunnels.—There are no tunnels on the line.

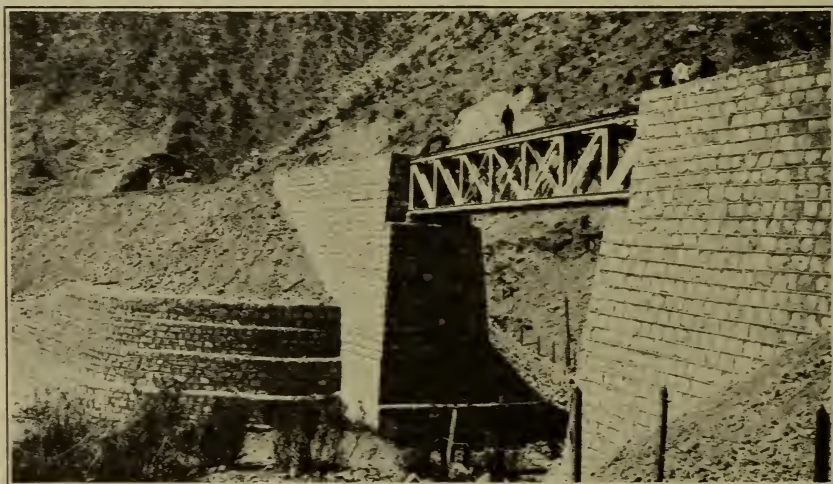


FIGURE 33.—Section of Longitudinal Norte Railway

MOTIVE POWER AND ROLLING STOCK

During the calendar year ended December 31, 1927, the line had the following motive power and rolling stock in operation:

Locomotives.....	40	Freight cars:	
Passenger coaches:		Box cars.....	50
First class.....	3	Cattle cars.....	20
Third class.....	20	Gondola cars.....	90
Miscellaneous.....	6	Flat cars.....	74
Sleeping, parlor, and dining..	6	Special cars.....	54
Baggage cars.....	6		

FERROCARRIL DE CHANARAL

The history of this railway dates from 1865, when a concession was granted to Don José K. Stevenson for the construction of a railway from the port of Chanaral to Salado, including a branch from Las Carpas to Las Animas. Practically no work was done under this concession, and in 1870 it was transferred to a company which inaugurated construction in 1872 and operated it for some time afterwards.

The railway was not kept in good condition, and in 1887 the company decided to sell it to Henry Bunster, who threatened to transfer the permanent way and rolling stock to Collipulli. In view of this fact, public interest was aroused and under a law enacted on January 20, 1888, the Government purchased the railway for 350,504 paper pesos. In 1897, the Government extended the line from Salado to Pueblo Hundo, a distance of 64 kilometers. The branch from Empalme to Chulo was constructed in 1904 on a meter gage, and during the same year the rest of the system was converted to the same gage. In addition, the Government also extended the branch line from Las Animas to Los Pozos. In all, the railway has 280 kilometers of meter gage track in operation, extending from Chanaral to Pueblo Hundo, 64 kilometers; Empalme to Chulo, 145 kilometers; and the Los Pozos branch, 11 kilometers. The remainder is made up of small branch lines to various mines. The railway runs from 4 meters above sea level to 175 meters, which is the highest point, while the maximum grade is one of 2.8 per cent.

PURCHASES

While this railway is a part of the State-owned system, it is leased to the Chilean Northern Railway Co. (Ltd.), and purchases are made by that company.

CHILEAN-ARGENTINE TRANSANDEAN RAILWAYS AND PROJECTS

Projected transandean routes connecting the seaports of Chile with those of Argentina are numerous, and some of them have been long contemplated. According to Chileans, inaccessibility to the eastern countries has proved a stumbling block to Chilean prosperity. The long and hazardous voyage around Cape Horn during the last part of the nineteenth and the first part of the twentieth centuries created handicaps too difficult to overcome in the world-trade markets. The opening of the Panama Canal in 1914 proved of great assistance in the development of trade routes to this area of South America, but even now it is claimed by Chileans that their prosperity depends entirely on direct rail connections between the principal Chilean centers of distribution and their prospective markets in other Latin American countries.

The first proposals for a transandean railway came in 1864, when a survey was made under the direction of William Wheelwright, an American railway engineer. The proposed railway was to be constructed from the port of Caldera, in Chile, through the San Francisco Pass, to Timogasta, in Argentina, at which point it would connect with the Argentine railways, and thus an outlet would be afforded to the Atlantic seaboard. Surveys for this project were made in 1868 and in 1872, while in 1874 the Chilean Government granted a concession to the Caldera-Copiapa Railway Co. for the construction of a railway over this route through the San Francisco Pass. The Government guaranteed 7 per cent return for 20 years on a capital investment of 9,000,000 pesos. In 1873 the Argentine Government granted the company a concession for the Argentine section of this proposed railway. Some preliminary work was done, although eventually both of these concessions lapsed.

In 1888 the Chilean Transandine Railway, which was the first line to actually be placed in operation over the Andes, was incorporated. This railway connects Valparaiso, in Chile, with Mendoza, in Argentina, and from that point offers transportation over the railway lines in Argentina to the eastern seaboard. It was opened to traffic on May 16, 1910, and since that time has been in continuous operation, excluding perhaps in the earlier years of its existence, a few months in the winter when, owing to snowdrifts in the pass through the mountains, service was suspended.

On June 12, 1889, permission to construct the Ferrocarril á Pirque, now known as the Llano de Maipo Railway, was granted. This was to be the first section of a transandean scheme connecting Santiago with San Carlos, in Argentina, a town some distance from Mendoza.

Another transandean project was inaugurated in 1909, when permission to construct the Ferrocarril General Cruz á Pemuco was granted to Zenon Mendez, although this project has never been accomplished.

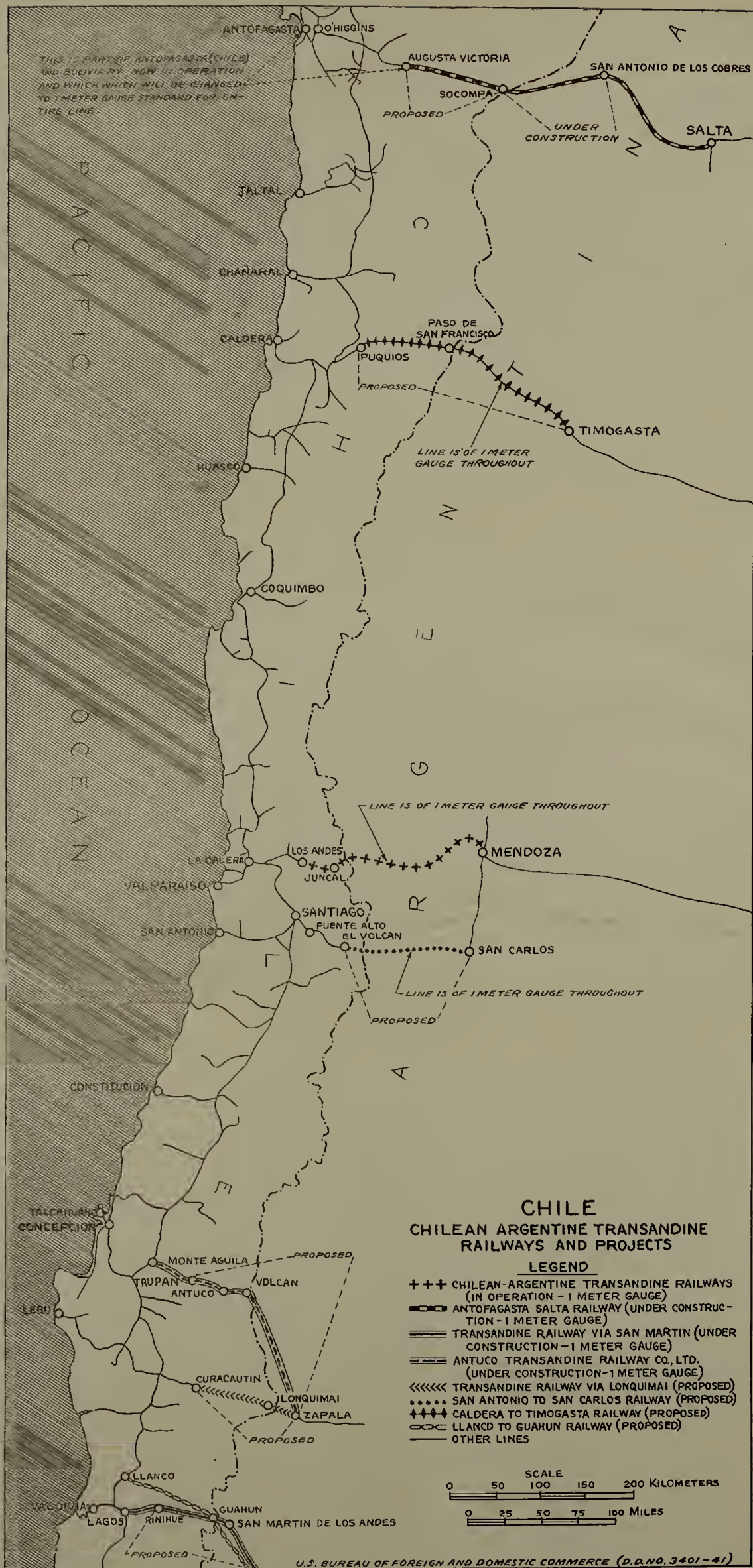


FIGURE 34

On July 29, 1910, a concession was granted to E. Carrasco y Cia. for the construction of a railway which would afford a through rail route from the port of Antofagasta, in Chile, via the Huaytaquina Pass, to Salta, in Argentina, at which point it would connect with the railway lines in Argentina and thus afford an outlet to the Atlantic.

Although this line was first contemplated in 1898, construction work did not commence until 1911. Numerous difficulties intervened and the concession was declared lapsed in 1914. Since that time the Argentine State Railways has constructed about 100 kilometers of line north of Salta, in Argentina, on this proposed line, although work has yet to be inaugurated in Chile, even though its construction has been discussed regularly each year and a new right of way chosen. The railway will now go through the Socompa Pass instead of the Huaytaquina Pass.

While most of the above projects pertain to the transandean routes of northern Chile, the southern section of the country also has its proposed international railways. Of these the Transandine por San Martin is perhaps the southernmost, and of that line, according to the Chilean Anuario Estadístico for 1925, 40 kilometers were constructed and are now in operation, although apparently no work has been carried on during the last few years. Recently there have been rumors that the Lanco to Guahun Pass Railway is to take over this project. The Transandine por Antuco was constructed a distance of 76 kilometers in 1908, and no additional work has since been accomplished, although the 76 kilometers are still in operation. The Transandine por Lonquimay and the San Antonio to San Carlos via El Volcon are projects which have been contemplated, although no actual construction work has ever been inaugurated.

The following translation of an agreement reached on April 25, 1922, between the Governments of Chile and Argentina pertaining to the construction and operation of two transandean projects, is appended as an example of the existing policy affecting the transcontinental railways.

The Governments of the Republics of Chile and Argentina, which have reciprocally agreed on the construction of two railway lines to unite, without transshipment; first, in the north, the Chilean port of Antofagasta with the Argentina city of Salta, and, afterward, in the south, the Argentina port of Bahia Blanca, by the prolongation of the southern railroad from Zapala, Argentina, to its junction with the southern Chilean line, completing their construction and putting them in condition to offer service to the public inside of three years from the date of ratification of this agreement, believe the time has arrived when fundamental principles should be established to govern the policies affecting transcontinental railways.

In consequence, the following fundamental bases for the regulation of tariffs in the transportation of merchandise over the lines to be constructed are agreed upon:

1. By reason of the end to be attained in the building of the above-mentioned lines the basis of calculation for minimum freight and livestock rates will be that of the actual cost per unit of labor—that is, per net kilometer ton of freight carried; in other words, that of the cost of operation only and without any capital charge.

When, for the common good, it is necessary to make an exception to the above-outlined principles, on a determined haul, either for the extraction of dormant raw materials or for the encouragement of products, the case will be subject to special agreements of limited duration.

2. In each case, and in accord with a study and exact determination of the conditions of production of the different articles which compose the traffic, and of their cost of production and selling price in consuming markets, taking into account the margin of profit that should result to the producer, general or

basic rates will be fixed in a way so that the increase which they show over the minimum tariff will reconcile the interests of the railway as a common carrier with its essential objective, leaving as much margin as possible for earnings on the capital employed, but without creating in any case impediments to industry and commerce, but making of the service of transportation, on the contrary, a concurrent factor in their progress.

3. The tariffs established on the bases formulated in the preceding paragraph will always be of an elastic nature in the sense that their application will be subordinated to the possibility of modifications required by special conditions of production. This elasticity must admit of decreases or increases, temporary or permanent, that will permit the adaptation of traffic without difficulty, to the different situations arising, keeping always in sight the high economic and social mission of the international lines.

4. Tariffs will normally be identical for merchandise in transit and merchandise destined for terminal or intermediate points on the line. Special tariffs may only be established in cases where local production may make protection necessary, but in such instances attempts will be made, if possible, to secure reciprocal compensations. In other cases, and where there is no conflict of interests, from this point of view, tariffs must aim to intensify the general traffic, which at the same time will encourage development of the respective zones of production and contribute to the progress and development of terminal ports.

5. The rolling stock to be used in common on both the Argentine and Chilean sections must be of a type that will permit of its safe circulation, without modification, on all sections of both international lines of the same gage.

To this end an agreement will be made, of a special technical character, aimed at the adoption of the same flange gages, rail contours, tires, couplers, brakes, etc.

The general standards adopted by the Berne convention for the railroads of Central Europe will be used in the interchange of rolling stock, and payments therefor will be made on the basis of the car-day and in no case by distance traveled.

The Chilean and Argentine Governments will make arrangements in due time for the necessary employees and application of the details of this agreement.

This agreement will be ratified and ratifications exchanged in this capital at as early a date as possible.

In acknowledgment of which the undersigned, Minister of Foreign Relations of Chile, and special envoy and minister plenipotentiary of the Argentine Republic in Chile, respectively, duly authorized for the purpose, hereto affix their signatures and seals in duplicate, in Santiago, this 25th of April, 1922.

In the following pages are shown the outstanding characteristics of each of the above-mentioned lines and all that is available regarding their present condition. The accompanying map illustrates the various transandine projects discussed.

CHILEAN TRANSANDINE RAILWAY (IN OPERATION)

(Ferrocarriil Transandino Por Juncal)

This company was registered in London on February 20, 1888, to take over a concession from the Chilean Government for the construction of a railway of 1 meter gage from the city of Los Andes to the Chilean-Argentine boundary. At this point it was to connect with a railway of the same gage extending to Mendoza in Argentina. This line is known as the Argentine Transandine Railway Co. (Ltd.), and a full discussion of it can be had by referring to Railways of South America, Part I: Argentina, Trade Promotion Series No. 32, by George S. Brady, American trade commissioner at Buenos Aires, issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce. The Chilean section is 70.79 kilometers in length and belongs to the company in perpetuity. Through traffic from Los Andes to Mendoza was inaugurated on May 16, 1910. Under an agreement effected between the Chilean Government and the Chilean Transandine Railway Co. in 1903, the Government guar-

anted 5 per cent interest per annum for 20 years on £1,500,000 bonds issued in order to complete its construction. During this period the Government met the guarantee in full. In May, 1921, a new contract was entered into between the Government and the company, details of which follow:

1. The Government shall issue State bonds for the sum of £825,000, with 8 per cent annual interest, to be amortized at the rate of 1 per cent yearly.

These bonds shall be exchangeable for those now issued by the company, secured by the property of the railway, and totaling £1,485,000, with a 5 per cent annual interest guaranteed by the Government for a period of 20 years.

To effect this exchange the company must obtain the permission of the holders of the present bonds.

2. The company shall take the necessary measures to convert into common stock the preferred shares now forming part of its capital stock. The holders of these preferred shares shall waive payment of unpaid dividends.

3. The company shall transfer to the Government a number of its shares equivalent to 70 per cent of the company capital.

The company obligates itself, in no case, to impose upon the Government the payment of any foreign tax, either on the value, or the profits, or for any other reason, in connection with these shares.

The Government, on its part, shall cooperate with the company to carry out any measures adopted for this purpose.

4. The Government shall have the right to appoint the members of the board of directors of the company, in conformity with the corresponding statutes, and in proportion to the amount of its shares, and can even appoint persons not stockholders as directors.

5. The company obligates itself to centralize the administration of its line and the administration of the Transandine Argentine Railway for common traffic service as if both railways formed one line.

This centralization shall be made with the approval of the President of the Republic, who is authorized to establish with the Argentine Government the regulations concerning the interchange of traffic and the intervention that both nations shall have in the making of rates.

6. The company shall issue bonds for the nominal value required to raise in cash the sum of £500,000 for these reasons:

(a) To cancel the bank obligations of the company when this agreement is finally approved.

(b) To construct protective works on the line assuring uninterrupted traffic at all seasons of the year.

(c) To electrify the line.

(d) To buy rolling stock and equipment and make other purchases necessary for the operation of the system, in accordance with the plan and estimate approved by the President of the Republic.

These bonds must be secured by a first mortgage on the railway. The amortizations and the interest payments shall be made from the receipts of the company in the manner provided for hereinafter; but the Government obligates itself to complete the interest payment, by means of a subsidy, in the event the receipts of the company are inadequate to make up the total.

The date and conditions of the issuance of bonds shall be established by agreement between the President of the Republic and the company.

7. The company shall keep all its records in Chile in the Castilian language, in the manner determined by the President of the Republic, who can inspect these records when he sees fit.

The net receipts, meaning the difference between the gross receipts and the expenses of administration, operation, and improvements, shall be used for the purposes indicated below and in the order shown:

(a) For the amortization of the bonds referred to in article 6.

(b) For the interest payments on the said bonds.

(c) For the creation of a reserve fund as approved by the President of the Republic.

(d) For reimbursing the Government for the sums expended for interest payments on the said bonds.

(e) The surplus remaining after these funds are used as aforesaid must be distributed among the stockholders as profits, until the amount reaches a total which is 8 per cent of the capital stock of £1,500,000.

(f) If the net receipts exceed 8 per cent of the capital stock aforesaid, the surplus shall be used first to complete reimbursements to the Government for the interest payments it has made on the bonds referred to in article 6, and second, to reimburse the Government for the amounts due it from the company because of the enforcement of law No. 1588, dated February 14, 1903, and the contract executed in conformity with the said law.

8. The rolling stock and construction and operation equipment for the use of the Chilean section of the railway shall not be subject to duties. The Government may agree that all rolling stock and operation equipment of the Argentine section, by way of reciprocity, be permitted in traffic service on the Chilean section free of all imports.

9. This is an ad referendum contract, subject to approval by the National Congress.

The separate operation of these lines did not result in good service, so on January 4, 1922, a unification contract was signed, effective as of July 1, 1923, by Samuel Hale Pearson, representing the Argentine Transandine Railway Co. (Ltd.), of London, and J. Harry White, representing the Chilean Transandine Railway Co. (Ltd.), of London. The terms of the contract provide for the joint operation and administration of the railway, each company to retain receipts exclusive to its own system and international traffic receipts to be apportioned on a stipulated basis. A translation of this contract is as follows:

1. The administration of the railroads which carry on jointly the traffic between Los Andes, in the Republic of Chile, and Mendoza, in the Argentine Republic, shall be effected in future by a joint committee formed of an equal number of delegates from the directorate of each one of the companies, in such a way that the exploitation of both lines may be carried on as though both railroads formed a single line belonging to a single owner. The total number of delegates to the joint committee shall be fixed by mutual agreement between the directorates of both companies.

2. The remuneration of the delegates to the joint committee shall be chargeable to the common administration and shall be fixed upon mutual agreement between the directorate of both companies.

3. The powers of the joint committee are limited to the administration of the combined lines, in accordance with the provisions of article 1 and for this purpose shall be as broad as those which are now enjoyed by the directors themselves, without any other restrictions than those which are set forth in the present agreement.

Any difficulty which may arise between the two companies in so far as combined administration is concerned, shall be settled without further recourse by an arbitrator to be appointed by mutual agreement between the directorates of both companies. In case it is not possible to arrive at an agreement in the selection of an arbitrator each one of the directorates shall designate an arbitrator and these if necessary shall proceed to the selection of a third. If they be unable to agree as to the selection of the third arbitrator he shall be selected from a list of persons submitted by each of the parties.

4. The joint committee shall proceed to the designation of a general manager of the combined lines for the purpose of carrying out its orders and for the management and exploitation of the line.

5. The joint committee shall itself decide where its headquarters are to be and shall also be allowed to change its headquarters as it may see fit.

6. The exploitation of the combined lines shall be effected by the common use of the locomotives and rolling stock of both companies.

7. The schedule of rates to be charged shall be fixed by the joint committee, subject to the laws which govern this matter in both countries, and to the agreements already made or to be made in the future between the two companies.

8. The distribution of the revenues and of the expenditures of the common administration between the two companies shall be made by the joint committee on the same basis as that which is at present in use; that is to say, each company shall have the exclusive right to its own receipts and the common receipts shall be distributed in accordance with the present regulations. The expenditures corresponding to each section shall be chargeable to the respective company, and the joint expenditures of the two companies shall be distributed in the proportion which may be established by the joint committee. Investment on capital account shall be chargeable to the company which is the owner of the section on



FIGURE 35.—Section of Transandine Railway

which the money is expended, and must be approved by the joint committee and no investment shall be made without such approval. The preceding stipulations as to the allotment of receipts and expenditures may be modified by subsequent agreement between both companies.

9. The joint administration shall maintain a system of accounting in such a manner as to make clear the distribution of receipts and expenditures referred to in article 8, and for this purpose shall make a monthly liquidation of accounts as between the administration of each of the two companies, and shall submit a statement of such liquidations to both with such other data as may be necessary for the proper carrying on of the accounting system which each one of the companies shall maintain separately. The person who may be named separately or jointly by these two companies for the auditing of the accounts of each of them shall have the right to inspect, at any time, the books of the joint administration and its corresponding vouchers. At the end of each fiscal year the profits shown by the balances of each of the companies shall be delivered to such companies and in case there should be a loss on either of them or on both, each one shall be chargeable with its own share of the loss.

10. Each company shall maintain its legal independence for all purposes not comprised within the terms of the present agreement, such, for example, as relations between the company and its shareholders, with the holders of its obligations, and with the respective Governments. Each company shall carry on separately, within its respective section, the new work and purchases of material which may be stipulated in the contract approved by the laws cited at the beginning of this agreement.

11. The Argentine Transandine Railroad Co., which has leased its lines to a third company with the authorization of the Argentine Republic, and in accordance with a contract actually in force, obligates itself as soon as the Government of the Argentine Republic may have terminated the authorization referred to, to make the necessary steps for the purpose of obtaining the return of the line within the shortest possible time in order that the joint administration may begin to operate in accordance with the stipulations of the present agreement, beginning July 1, 1923, at the latest.

12. Each one of the companies shall make an inventory of its property and shall deliver the same to the joint administration. The joint administration shall begin to operate from the date of the delivery of the inventories in accordance with the stipulations of this law.

13. The duration of the present agreement is not limited in point of time. It can not be rescinded nor modified except by common agreement of both companies and with the approval of both Governments.

14. The present agreement is subject to the approval of both companies and to the approval of the Government of the Argentine Republic and the Chilean Republic.

As of June 30, 1928, the main line of the Chilean section of the railway was 70.99 kilometers in length, of which 34 kilometers, from Los Andes to Rio Blanco, is of adhesion track, while the remainder as far as Carracoles, which is a point reached just before the international boundary, is "ABT" rack system. In addition there were 7.47 kilometers of branch track. The Argentine section from the international boundary to Mendoza is 179 kilometers in length. The railway runs from Los Andes in Chile to Mendoza in Argentina and from these points connects with other railway lines so that through communication is afforded, via this railway, from the Pacific to the Atlantic Oceans.

On October 29, 1927, the section between Juncal and Carracoles was completely electrified and opened to traffic. The electrification work on this line was done under the authority of a decree issued August 5, 1925, which authorized the company to undertake the work of electrifying the line according to a plan submitted by Charles Wilson and the technical advisor of the line, J. J. Fifer, which plan was approved by both the company and the Government.

The following details pertain entirely to the Chilean Transandine Railway:

OPERATING OFFICIALS

The operating officials for the fiscal year ended June 30, 1928, are as follows:

Directors.—Vivian Hugh Smith, Esq., chairman, 23 Gt.; W. S. Eyre, Esq., 148 Leadenhall Street, London, E. C. 3; A. Martin, secretary, 148 Leadenhall Street, London; Sr. H. E. Don Antonio Huneeus, Chilean Government representative, 148 Leadenhall Street, London, E. C. 3; Sr. Vincente Echeverria, Chilean Government representative, 148 Leadenhall Street, London, E. C. 3; Sr. M. Vergara, Chilean Government representative, 148 Leadenhall Street, London, E. C. 3.

General manager.—J. H. White, Casilla 66, Los Andes, Chile (resigned in 1927).

Assistant manager and traffic manager.—L. A. Woodbridge, Casilla 66, Los Andes, Chile.

Chief accountant.—A. E. Righton, Casilla 66, Los Andes, Chile.

Chief engineer.—W. G. Watkins, Casilla 66, Los Andes, Chile.

Locomotive superintendent.—W. G. Jeffries, Casilla 66, Los Andes, Chile.

Chief storekeeper and purchasing agent.—H. Steenbuch, Casilla 66, Los Andes, Chile.

Telegraph and telephone superintendent.—R. Raven-Hart, Casilla 66, Los Andes, Chile.

PURCHASES

With the exception of very small items all purchase are made through the main office of the company located at 148 Leadenhall Street, London, E. C. 3, England.

FINANCES¹

The capital now consists of the shares and debenture stock below; the 5 per cent debentures for £1,485,000 formerly outstanding were exchanged in August, 1922 (effective as from July 1, 1922), for £825,000 of Chilean Government 8 per cent bonds with a 1 per cent sinking fund in accordance with clause (a) above of the contract of May, 1921. Credit to capital account at June 30, 1927, £17,713, after debiting £209,459 discounts and expenses, etc., on debenture issues.

Ordinary shares of £1 each, fully paid, total authorized £1,500,000, of which 70 per cent has been transferred without payment to the Chilean Government. The share capital was originally issued in payment for the concession and to contractors.

Seven and one-half per cent, first mortgage debenture stock, £528,207 outstanding balance of £542,000, for which applications were received in January, 1923, by Morgan, Grenfell & Co., at 96½ per cent. Authorized, £542,000. Interest is payable June 1 and December 1, and the principal is repayable by the operation of a cumulative sinking fund of 1 per cent per annum, calculated to redeem the whole of the stock by 1953 in accordance with the amortization table attached to the trust deed; any balance of sinking fund not set aside in any year is to be made good out of the net receipts of future years after making like provision, and the fund is applicable to purchase of stock under par (exclusive of interest) or to drawings at par, while the company reserves the right to redeem all or any part of the stock on June 1, 1933, or on any subsequent interest date, at par and accrued interest on three months' notice. The payment of interest on the stock is guaranteed by the Republic of Chile as long as any of the stock is outstanding. The stock is secured by trust deed as a first specific charge upon the company's railway, land, buildings,

¹ Stock Exchange Yearbook, 1929.

and other real property, and as a first floating charge upon the remaining assets and property and the undertaking, present and future (trustee; Royal Exchange Assurance). Price in official list 100½.

Accounts to June 30, submitted in February. No dividend yet; debenture interest has been duly met by Chilean Government under its guarantee (see above). Gross receipts 1926-27, £124,711 (compared with £110,155). Carried forward debit of £146,037 (compared with £94,892), against which there was liability to Chilean Government (repayable only out of net receipts) of £152,118 for interest paid on debenture stock.

The following tables show the balance sheet, revenue account, and net revenue account of the Chilean Transandine Railway Co. (Ltd.), for the fiscal years ended June 30, 1927 and 1928.

BALANCE SHEET, JUNE 30, 1927

LIABILITIES				£	s.	d.
Capital account, balance per account annexed.....				17,713	6	2
Sundry creditors:	£	s.	d.			
London.....	21,790	4	5			
Chile.....	13,613	10	1			
				35,403	14	6
Loan, repayable by installments, 1927-1932, and accrued interest.....				28,718	12	4
Bank of Liverpool & Martins (Ltd.), current account.....				235	9	6
7½ per cent first mortgage debenture stock, interest accrued to June 30, 1927.....				3,301	5	11
Trustees of 7½ per cent first mortgage debenture stock:						
Provision for amortization—	£	s.	d.			
Balance of amount due May 1, 1927..	3,728	19	9			
Amount payable, May 1, 1928.....	6,733	0	0			
				10,461	19	9
Unclaimed debenture interest:						
5 per cent debentures (canceled issue)....	64	19	1			
7½ per cent first mortgage debenture stock.....	97	11	3			
				162	10	4
Chilean Government, advances by the Government toward payment of interest on 7½ per cent first mortgage debenture stock, payable out of future net receipts.....				152,118	0	0
				248,114	18	6

There are contingent liabilities to the Chilean Government in respect of taxation and liabilities payable out of future profits for obligations arising under law 1588 of 1903 and the contract of May 10, 1921.

ASSETS				£	s.	d.
Stores and materials on hand and in transit on revenue account at cost, as valued by general manager.....				35,826	9	9
South American Hotel, Los Andes, share of estimated realizable value of property not yet disposed of.....				214	4	1
Sundry debtors:						
Chilian Government—Chile, 1918-1920 accounts.....	£	s.	d.	1,000	0	0
Chilian Government—Chile, other accounts.....	1,420	12	7			
Traffic accounts.....	982	2	6			
Miscellaneous accounts and prepayments, less reserve.....	2,804	16	10			
				6,207	11	11

Cash at bankers and in hand:

	£	s.	d.	£	s.	d.
Bankers in London—						
Deposit accounts.....	18,108	17	0			
Current accounts.....	5,252	16	5			
Bankers and agents in Chile.....	30,922	3	0			
In hand and in transit.....	5,545	10	3			

Net revenue account, balance as per account annexed.....	59,829	6	8	146,037	6	1
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248,114 18 6

BALANCE SHEET, JUNE 30, 1928

LIABILITIES

	£	s.	d.	£	s.	d.
Capital account, balance per account annexed.....	22,828	6	4			
Sundry creditors:						
London.....	15,835	11	2			
Chile.....	7,133	18	8			
Loan, repayable by installments, 1928-1932, and accrued interest.....	22,969	9	10			
7½ per cent first mortgage debenture stock, interest accrued to June 30, 1928.....	23,104	8	2			
Trustees of 7½ per cent first mortgage debenture stock:	3,301	5	11			
Provision for amortization—						
Balance of amount due May 1, 1928.....	10,461	19	9			
Amount payable May 1, 1929.....	7,238	0	0			
Unclaimed debenture interest:	17,699	19	9			
5 per cent debentures (canceled issue)....	61	6	7			
7½ per cent first mortgage debenture stock.....	66	0	0			
Chilean Government, advances by the Government toward payment of interest on 7¼ per cent first mortgage debenture stock, payable out of future net receipts.....	127	6	7			
	191,733	10	6			
	281,764	7	1			

There are contingent liabilities to the Chilean Government in respect of taxation and liabilities payable out of future profits for obligations arising under law 1588 of 1903 and the contract of May 10, 1921.

ASSETS

	£	s.	d.	£	s.	d.
Stores and materials on hand and in transit on revenue account at cost, as valued by company's officials.....	42,964	11	10			
South American Hotel, Los Andes, share of estimated realizable value of property not yet disposed of.....	214	4	1			
Sundry debtors:						
Chilean Government.....	1,698	7	8			
Traffic accounts.....	2,415	5	1			
Miscellaneous accounts and prepayments, less reserve.....	2,370	8	2			
Cash at bankers, in hand, and in transit:	6,484	0	11			
Bankers in London—						
Deposit accounts.....	11,063	0	7			
Current accounts.....	5,226	4	4			
Bankers and agents in Chile.....	17,849	6	1			
In hand and in transit.....	3,219	0	0			
Net revenue account, balance as per account annexed.....	37,357	11	0			
	194,743	19	3			
	281,764	7	1			

REVENUE ACCOUNT, JULY 1, 1926, TO JUNE 30, 1927

	DEBIT					
	£	s.	d.	£	s.	d.
Maintenance, abstract B:						
Permanent way and works	45,773	15	9			
Locomotives	17,585	12	7			
Coaching stock	1,412	18	9			
Goods and livestock wagons	1,292	12	0			
				66,064	19	1
Running expenses, abstract B:						
Locomotives	29,134	3	7			
Vehicles	848	16	6			
				29,983	0	1
Traffic expenses, abstract B				11,070	8	6
General charges, Chile, abstract B				19,129	16	8
Administrative expenses, London:						
Directors' and trustees' remuneration	1,300	0	0			
Rent and office expenses	1,516	5	0			
Notarial and legal charges	205	12	7			
				3,021	17	7
Joint administrative expenses, London				431	11	7
				129,701	13	6
	CREDIT					
Traffic receipts, abstract C:				£	s.	d.
Passengers				54,447	7	9
Parcels and luggage				2,290	19	4
Goods				27,889	9	0
Livestock				31,890	4	5
Telegrams				40	8	3
Special trains				2,698	15	10
Miscellaneous, postal subsidy, haulage adjustments, etc.				5,454	2	10
Balance to net revenue account				4,990	6	1
				129,701	13	6

REVENUE ACCOUNT, JULY 1, 1927, TO JUNE 30, 1928

	DEBIT					
	£	s.	d.	£	s.	d.
Maintenance, abstract B:						
Permanent way and works	45,633	1	6			
Locomotives	11,601	3	9			
Coaching stock	1,964	16	6			
Goods and livestock wagons	1,588	4	0			
				60,787	5	9
Running expenses, abstract B:						
Locomotives	36,438	13	11			
Vehicles	821	9	3			
				37,260	3	2
Traffic expenses, abstract B				13,888	2	7
General charges, Chile, abstract B				19,157	13	8
Sundry expenses accrued, Chile				947	4	8
Administrative expenses, London:						
Directors' and trustees' remuneration	1,257	10	8			
Rent and office expenses	1,407	5	0			
Notarial and legal charges	6	6	0			
				2,671	1	8
Joint administrative expenses, London				380	11	3
				135,092	2	9
	CREDIT					
Traffic receipts, abstract C:				£	s.	d.
Passengers				61,082	19	10
Parcels and luggage				3,955	4	10
Goods				21,222	8	3
Livestock				24,970	5	3

Traffic receipts, abstract C—Continued.

	£	s.	d.
Telegrams.....	58	11	11
Special trains.....	8, 541	8	1
Miscellaneous, postal subsidy, haulage adjustments, etc.....	7, 257	0	7
Balance to net revenue account.....	8, 004	4	0
	135, 092	2	9

NET REVENUE ACCOUNT, JULY 1, 1926, TO JUNE 30, 1927

DEBIT			
	£	s.	d.
Balance brought from last account.....	94, 892	7	8
Balance from revenue account.....	4, 990	6	1
South American Hotel, share of loss for year.....	176	4	2
Interest on 7½ per cent first mortgage debenture stock.....	39, 790	11	3
Provision for amortization of 7½ per cent first mortgage debenture stock.....	6, 733	0	0
	146, 582	9	2
CREDIT			
	£	s.	d.
Interest received, less payable.....	165	17	10
Transfer fees.....	17	16	0
Reserve for loss by fire at South American Hotel, written back.....	361	9	3
Balance as per balance sheet.....	146, 037	6	1
	146, 582	9	2

NET REVENUE ACCOUNT, JULY 1, 1927, TO JUNE 30, 1928

DEBIT			
	£	s.	d.
Balance brought from last account.....	146, 037	6	1
Balance from revenue account.....	8, 004	4	0
South American Hotel share of expenses for year.....	2	16	4
Interest on 7½ per cent first mortgage debenture stock.....	39, 615	10	6
Provision for amortization of 7½ per cent first mortgage debenture stock.....	7, 238	0	0
	200, 897	16	11
CREDIT			
	£	s.	d.
Redemption of loan installments charged to revenue.....	5, 612	12	4
Interest received, less payable.....	527	5	4
Transfer fees.....	14	0	0
Balance as per balance sheet.....	194, 743	19	3
	200, 897	16	11

In addition to previously stated financial returns of the company there is given a comparative statement which shows the operating revenue and operating expenses of the railway during the calendar years 1918 to 1927, inclusive.

OPERATING RECEIPTS AND EXPENSES ¹

Year	Receipts	Expenses	Gain	Loss
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	7, 264, 089	5, 754, 780	1, 509, 309	
1919.....	4, 855, 329	5, 137, 920		282, 591
1920.....	5, 770, 584	6, 069, 912		299, 328
1921.....	3, 484, 902	3, 917, 493		432, 591
1922.....	3, 368, 676	3, 631, 296		262, 620
1923.....	4, 740, 738	3, 813, 417	927, 321	
1924.....	3, 993, 387	3, 826, 113	167, 274	
1925.....	3, 949, 078	3, 487, 795	471, 174	
1926.....	4, 226, 364	4, 667, 621		441, 257
1927.....	5, 725, 634	5, 843, 757		118, 123

¹ Estadística de los Ferrocarriles en Explotación de Chile.

TRAFFIC

The following table indicates the number of passengers and amount of freight carried by the railway during the calendar years 1918 to 1927, inclusive.

FREIGHT AND PASSENGER TRAFFIC ¹

Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1918.....	17, 868	82, 114	1922.....	17, 373	25, 020	1926.....	18, 480	50, 974
1919.....	15, 482	48, 535	1923.....	18, 947	56, 757	1927.....	17, 186	65, 433
1920.....	21, 325	43, 861	1924.....	20, 168	38, 963			
1921.....	18, 255	23, 132	1925.....	20, 022	38, 567			

¹ Estadística de los Ferrocarriles en Explotación de Chile.

² Anuario Estadística de la República de Chile.

COMMODITIES CARRIED DURING THE FISCAL YEARS ENDED JUNE 30,
1923 TO 1928 ¹

Commodities	1923	1924	1925	1926	1927	1928
	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>
Peas, chick peas, and lentils.....	102	76	46	48	60	62
Beans.....	193	244	1, 045	158	97	131
Barley and malt.....	262	90	13		130	43
Wheat and other cereals.....	17	35	38	19	217	393
Garlic.....	1, 080	954	661	736	615	1, 920
Potatoes.....	129	72	172	624	25	27
Walnuts.....	834	887	1, 305	898	1, 261	1, 389
Other fruits and vegetables.....	1, 008	539	1, 057	1, 735	9, 172	2, 055
Preserves and tinned goods.....	579	402	447	467	575	546
Hemp and hemp seed.....	79	206	47	79	90	83
Timber, boarding, staves, etc.....	850	2, 093	2, 628	3, 100	1, 925	3, 259
Extract of quebracho.....		90			10	
Other agricultural and forest products.....	153	265	273	1, 578	2, 232	3, 408
Flour.....	27	51	91	1, 390	717	2, 362
Sugar.....	5	11	29	14	10	11
Unground coffee.....	0. 32	0. 65				
Sheep dip.....	161	0. 69	1			
Cement.....	508	61	4, 479	2, 831	844	305
Salt peter.....	3	31	125	60	204	253
General provisions.....	88	227	341	203	320	83
Liquors.....	58	63	207	76	88	133
Theatrical and personal effects.....	140	183	297	190	117	100
Cloth goods, drapery, etc.....	13	32	6	4	12	4
Hardware.....	22	69	21	10	15	60
Machinery and vehicles.....	177	102	123	99	253	113
Coal and coke.....	430	10, 869	5, 664	7, 451	9, 786	5, 718
General merchandise.....	719	552	1, 372	1, 102	646	726
Gypsum.....		212				
Copper ore.....	132	840	759	569	101	46
Construction and building materials.....		838	150	743	1, 448	871
Sundries.....				321	524	277
Total.....	7, 769	20, 095	21, 397	24, 505	31, 494	24, 378

¹ Data taken from annual reports of Chilean Transandine Railway Co. (Ltd.).

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The railway runs from 830 meters above sea level at Los Andes to an elevation of 3,205 meters at Frontier, which is the highest point on the line.

Gage.—The railway is of 1-meter gage throughout.

Grades.—The average upgrade is 25 per 100 for about 6,944 meters. In view of the abrupt incline, it was necessary to install 5 sections of cog track where the most difficult grade is 80 per 100 for a distance of 1,340 meters. There is a maximum down grade of 10 per 100 for a distance of 660 meters.

Curves.—The radius of the minimum curve on the adhesion section is 100 meters, while on the rack section it is 200 meters. The 100-meter curves are stayed with $\frac{3}{4}$ -inch rods.

TRACK MATERIAL

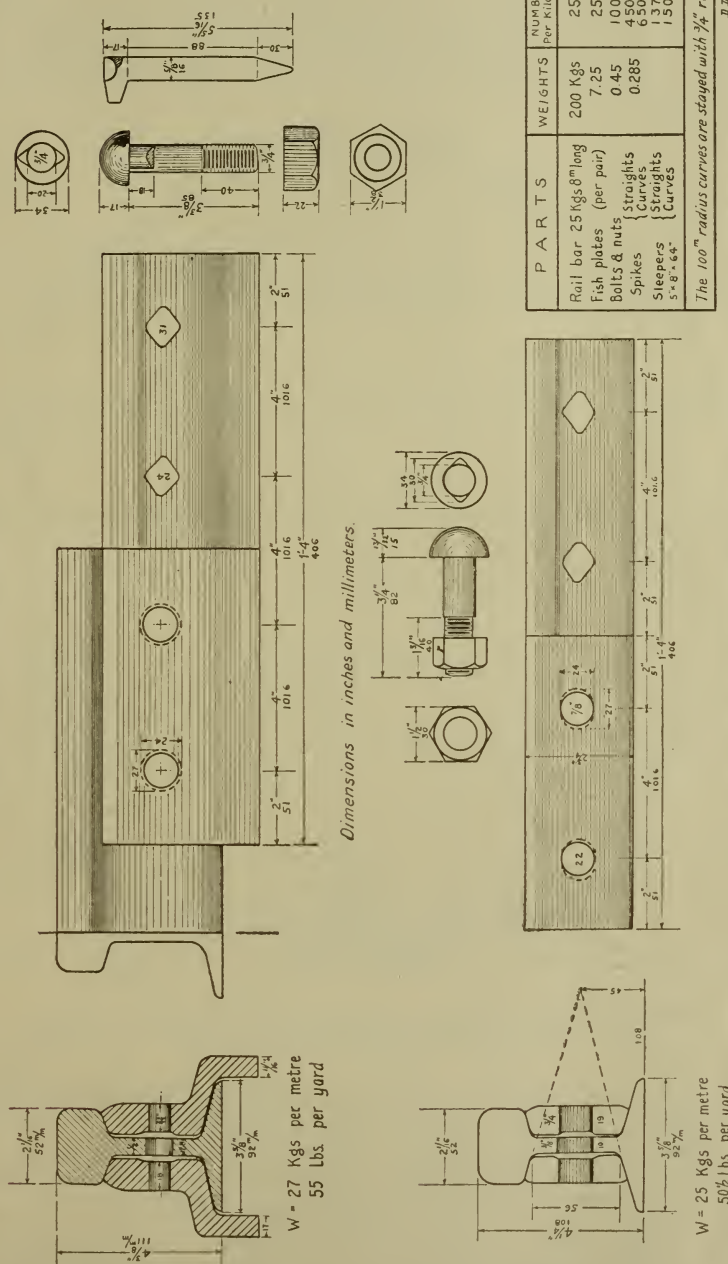


FIGURE 36.—Track material, Chilean Transandine Railway

Ballast.—Cracked stone and earth secured locally is used as ballast throughout the system.

Rails.—Steel rails, weighing 25 and 27 kilos per meter, in 8-meter sections, are used. On the "ABT" system of rack, three-tooth steel rails are placed in the center of the track, which engage the pinions of the locomotive.

Ties.—On the rack section, steel ties, 1.80 meters by 20 by 9 centimeters, weighing 53 kilos each, are used. These ties, which are secured from England and Germany, are spaced on 88-centimeter centers. On the adhesion section of the line wooden ties secured in southern Chile, made of roble pellin (Chilean oak) 15 by 20 centimeters by 2 meters, are used. These ties are spaced 1,430 to the kilometer.

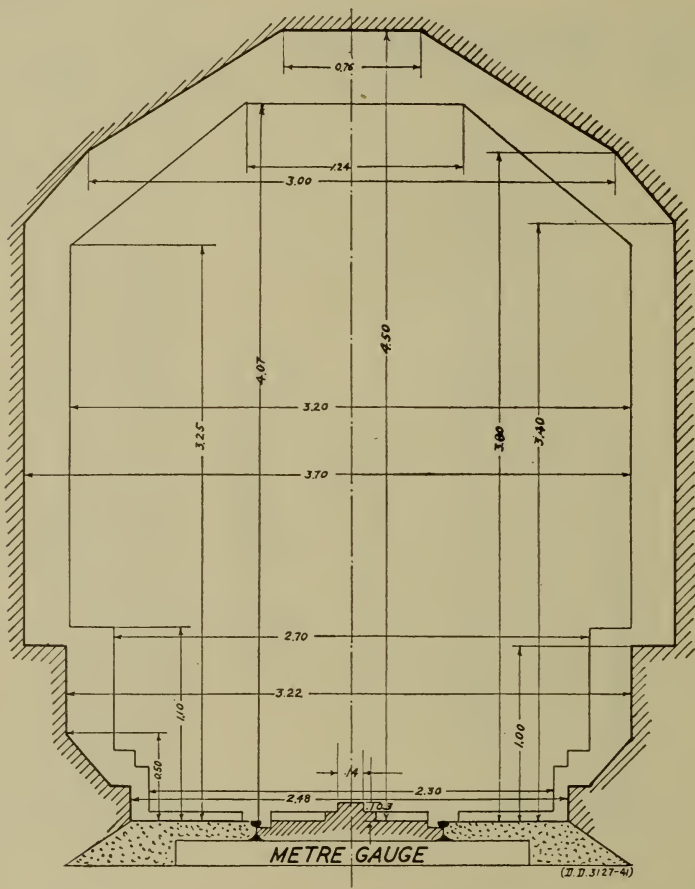


FIGURE 37.—Chilean Transandine Railway, minimum construction and maximum loading gage, dimensions in meters

Water.—Water is secured from wells and pumped into rectangular steel storage tanks. There are 12 water tanks having a total capacity of 3,200 hectoliters. The maximum distance between water stations is 5.9 kilometers.

Fuel.—English and Chilean coal are used on the line for fuel. There are four coal stations having a total capacity of 250 tons and one electric substation. The maximum distance between coaling stations is 18 kilometers.

Power.—Power to be used in the electrified section of the line will be furnished by the Compañía Chilean de Electricidad of Santiago. The power line is supported by tubular steel posts spaced 5 meters apart on the straight sections of the line and 2 meters apart on the curves. The substation is located at Juncal and has a capacity of 4,500 kilowatts. The railway is responsible for the installation and conservation of the high-tension transmission line which will be distributed to the different substations now installed. The energy will be received

by the railway at Los Andes in the form of sufasies of 42,000 volts and 50 periods of frequency. The most convenient system of traction, considering the predominating conditions, is a continuous current of 3,000 volts which is the same as the one now in use on the State Railways. As a result of this, intercommunication will be facilitated between the terminals of the State Railways and the Transandine line. The railway has purchased three electric engines of 3,000 volts which are CC. Brown-Boveri-Swiss make. These locomotives are for 1-meter gage track and are adapted to the service equally on either adhesion or cog rail. The locomotives cost £21,390 sterling each.

Employees.—During 1927 the line's personnel numbered 751.

Signaling.—Semaphore signals are employed throughout the entire system.

Clearance.—The accompanying diagram indicates the clearance limits of the line both for Chile and Argentina.

Maintenance.—The line is kept in excellent condition and is able to carry the traffic required. It is understood the maximum load fixed for hauling over the line is 12 metric tons per axle load.

Bridges.—The railway has 21 large bridges about 400 meters in total length, and 134 culverts and small bridges extending over a total length of 180 meters. The two largest bridges are each 30 meters in length.

Tunnels.—The railway has 55 tunnels aggregating 6,960 meters in length. The longest tunnel is known as the Summit Tunnel, which is 10,391 feet in length.

MOTIVE POWER AND ROLLING STOCK

The following tables show the number of locomotives and passenger and freight cars in operation on June 30, 1928.

LOCOMOTIVES

Number	Service	Make	Class	Coupled wheels	White classification
STEAM					
1	Yard	Hawthorn, Leslie & Co.	Adhesion	6	0-6-0
1	Ballast	Shay Lima Locomotive Machine Co.	do.	12	0-6-0
2	Passenger and cargo	Borsig	Adhesion and rack.	6	2-6-2
1	do	do	do.	6	2-6-4
3	do	Kitson-Myer	do.	8	0-8-0-6-0
1	do	Esslingen	do.	8	0-6-0-8-0
ELECTRIC					
3	Passenger and cargo	Swiss Locomotive and Machine Works.	Adhesion and rack.		

Number	Ton weight		Cylinders					
	Empty	Working	Adhesion			Rack		
			Number	Diameter	Stroke	Number	Diameter	Stroke
STEAM				<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	<i>Inches</i>
1-----	24. 5	28	2	14½	20			
1-----	47. 5	59	3	12	15			
2-----	36. 5	48	2	15¾	19¾	2	15¾	17¾
1-----	44	55. 25	2	15¾	19¾	2	15¾	17¾
3-----	67	82	2	16½	19	2	18	19
1-----	66	81	2	15¾	19¾	2	21¾	17¾

PASSENGER AND FREIGHT CARS

Type	Number	Capacity	Type	Number	Capacity
PASSENGER CARS			FREIGHT CARS—continued		
First-class cars.....	3	<i>Seats</i> 99	Flat:		<i>Seats</i>
Second-class cars.....	4	248	Bogie.....	2	40
Reserved.....	1		Two axle.....	6	48
Inspection.....	1		Open:		
Luggage vans.....	1	<i>Tons</i> 10	Bogie.....	18	360
			Two axle.....	18	150
Total.....	10		Cattle:		<i>Head</i>
Pullman train: ¹			Bogie.....	3	54
Saloons.....	4		Two axle.....	6	54
Kitchen and baggage van.....	1				<i>Tons</i>
Dining car.....	1		Brake: Two axle.....	6	48
Baggage wagon.....	1		Auxiliary:		
Total.....	7		Bogie.....	1	20
FREIGHT CARS			Two axle.....	2	20
Covered goods:		<i>Tons</i>	Iron bogie:		
Bogie.....	37	740	Open.....	5	100
Two axle.....	18	180	Flat.....	5	100
			Total.....	127	

¹ This train is owned jointly by the Argentine Transandine Railway and Chilean Transandine Railway Co. (Ltd.) in the proportion of 57 and 43 per cent, respectively.

Couplers.—Ordinary link and pin and Henricot automatic couplers are used. These couplers are all 30 inches above the top of rails.

REPAIR SHOP

There is one repair shop located at Los Andes which, when working to capacity, employs 130 men. The equipment is capable of handling castings up to 1,400 kilos. There are two foundries, one brass with a capacity of 280 kilos, and the other iron with a capacity of 1,400 kilos. An average of two locomotives and six cars are repaired in this shop during the year. Among the power-driven machinery used in the repair shop, which is electrically operated, are 11 lathes, 3 shapers (standard), 2 bench shapers, 1 diestock, and 1 milling machine.

ANTOFAGASTA TO SALTA RAILWAY (UNDER CONSTRUCTION)

This proposed northern railway across the Andes was first contemplated in 1898 by an engineer named Rauch who made the initial survey for the Argentine section of the line. On July 29, 1910, a concession was granted by the Argentine Government to Emilio A. Carrasco to construct the Argentine section. In 1920 the Government of Argentina took over all rights to the Carrasco concession which had been declared forfeited in 1914. New surveys were made and construction work commenced by the Government under the direction of the chief engineer of the Argentine State Railways, Richard F. Maury, an American citizen. In August, 1924, the first section of 44 miles was opened to traffic. Since that time it has been extended about 18½ miles in Argentina, although work has not yet been commenced in Chile. (For further historical and technical details regarding the Argentine section of this railway, refer to "Railways of South America, Part I: Argentina, Trade Promotion Series No. 32.")

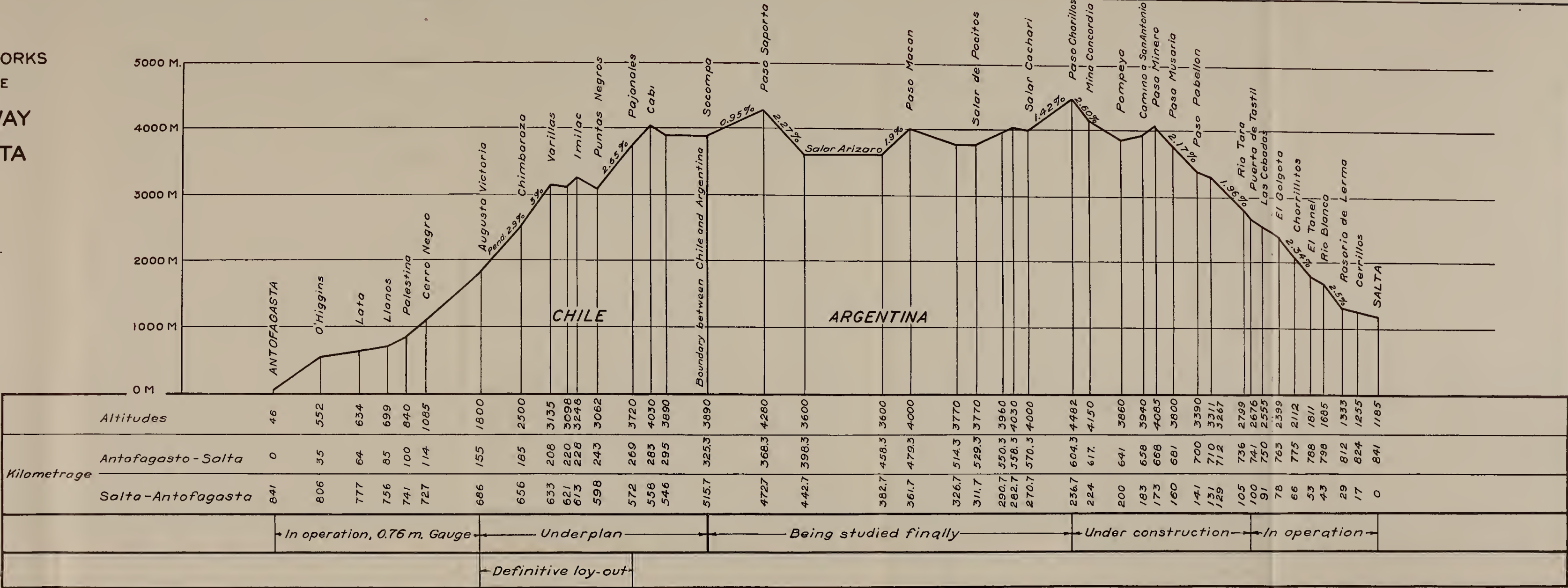
During the year 1923 the Chilean Government agreed to provide a connecting line on the Chilean side from Augusta Victoria, one of

ADMINISTRATION OF PUBLIC WORKS
GENERAL R.R. INSPECTOR'S OFFICE

TRANSANDINE RAILWAY
ANTOFAGASTA TO SALTA

GENERAL PROFILE

Scales { Vertical—1cm. = 400m.
Horiz. — 1cm. = 20Km.



the termini of the Antofagasta (Chile) & Bolivia Railway, to Socompa on the Chilean-Argentine border. The Argentine section, which on December 31, 1927, had been extended from Salta, a termini of the Argentine Government Railways, as far as San Antonio de Los Cobres, a distance of 62 miles, will be completed to Socompa, thus affording a through route between Chilean and Argentine points. The length of the Argentine section when completed will be 308 miles, while the Chilean section will be 64 miles. One-meter gage will be standard for the entire system. In April, 1927, the Chilean committee of engineers ended its survey of the proposed Chilean route and estimated that the Chilean section will cost 31,200,000 pesos to construct. According to reports in December, 1928, construction of this railway was to commence in 1930, providing satisfactory negotiations with the Argentine Government were reached.

The engineer in charge of the technical matters pertaining to the Chilean section of this railway is Don Theodore Schmidt, Ministre de Industries, Obras Públicas, Santiago, Chile. The Argentine section is under the direction of the manager of the Argentine State Railways, Calle Peru, 672, Buenos Aires.

LLANO DE MAIPO RAILWAY (PARTLY CONSTRUCTED)

(Providencia to Puente Alto Railway; Santiago to Barrancas Railway; Ferrocarril a Pirque)

The history of this railway dates from June 12, 1889, when permission was granted to Francisco Subercaseaux to construct a railway extending from the Providencia station in Santiago to Barrancas. This railway was first known as the Ferrocarril a Pirque and originally was intended for the first section of a transandean scheme connecting Santiago via Pirque and Barrancas with San Carlos, a town in Argentina some distance from Mendoza. The railway was completed and opened to traffic as far as Puente Alto in 1893, a distance of 21.6 kilometers, and since that time has been operated with practically no additions, exclusive of sidings which have been installed from time to time with an aggregate length of 2 kilometers. At the end of the calendar year 1927 the railway had 23.60 kilometers of track in operation. The railway at Puente Alto connects with the Puente Alto Volcan Railway (Chilean Military Railway). During the last few years freight traffic has increased considerably owing to the production activities of a paper mill located at Puente Alto and a gypsum mine at Volcan.

The railway is controlled by the Sucesión de Emiliana Subercaseaux de Concha, which owns large estates in the vicinity. The German firm of Siemens, Schuckert (Ltd.) also owns considerable stock. All purchases are made through the general manager, Hextor Marchant, who should be addressed in care of the railway at Estación Providencia, Santiago.

The railway originally constructed for steam traction was electrified in 1925. The power, which is supplied by the Compañía Chilena de Electricidad, is of alternating current of 12,000 volts, which is transformed into a current of 600 volts through a substation erected at Bella Vista.

FINANCES

The company was capitalized at 4,050,776 pesos in December, 1927. The operating revenues and expenses of the railway for the calendar years 1918 to 1928 were as shown in the following table:

Year	Receipts	Expenses	Gains	Year	Receipts	Expenses	Gains
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	904,953	758,487	146,466	1924.....	574,986	504,459	70,527
1919.....	833,799	690,252	143,547	1925.....	639,791	545,636	94,155
1920.....	953,244	831,552	121,692	1926.....	891,140	642,663	248,477
1921.....	911,544	720,963	63,527	1927.....	505,061	386,946	118,115
1922.....	708,581	632,046	76,545	1928.....	900,000	650,000	250,000
1923.....	721,122	609,441	111,681				

NOTE.—Data from Anuario Estadística de la República de Chile, except the year 1928 which was secured from the company.

TRAFFIC

The freight and passenger traffic of the railway for the calendar years 1918 to 1928 was as shown in the following table:

Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried
	<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>
1918.....	98,219	306,604	1922.....	66,682	208,561	1926.....	69,188	488,486
1919.....	93,314	335,601	1923.....	65,130	245,643	1927.....	75,764	331,400
1920.....	68,407	266,843	1924.....	67,056	174,814	1928.....	64,000	273,000
1921.....	73,530	246,495	1925.....	55,848	198,226			

NOTE.—Data from Anuario Estadística de la República de Chile, except the year 1928 which was secured from the company.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the railway is 1 meter.

Grades.—The maximum upgrade is one of 13 per 100 for a distance of 220 meters while the maximum down grade is 11 per 100 for 160 meters.

Curves.—The minimum curve radius on the railway is 180 meters.

Ballast.—Gravel or small river bottom stones, secured locally, are used for ballast.

Ties.—Roble pelling ties, 1.80 by 0.20 by 0.15 meters, spaced 1,500 to a kilometer, are used.

Rails.—Steel rails, weighing 25 kilograms per meter in 7-meter sections, are used.

Signals.—There are no signals in use on the road.

Maintenance.—The road is in good condition to carry the traffic it is required to bear.

Fuel.—Coal is used for fuel. There is one coal station with a capacity of 100 tons.

Water.—There are two water stations with a total capacity of 220 hectoliters. These stations are 11 kilometers apart.

Culverts and small bridges.—There are 31 culverts and small bridges totaling 63 meters in length.

Employees.—There were 69 employees at the end of the calendar year 1927.

Bridges.—There are three bridges having a total length of 53 meters.

Tunnels.—There are no tunnels on the line.

MOTIVE POWER AND ROLLING STOCK²

For the calendar year ended December 31, 1925, the railway had the following motive power and rolling stock in operation:

² Anuario Estadística de la República de Chile, 1928, shows the following equipment owned at end of calendar year 1927: 3 electric locomotives, 4 steam locomotives, 9 passenger cars, and 50 freight cars.

LOCOMOTIVES

Locomotives with separate tender.....	4
Locomotives of 18 tons net weight and 22 tons gross weight..	2
Locomotives of 24 tons net weight and 28 tons gross weight..	2

ROLLING STOCK

Passenger cars in use.....	11
Total number of axles.....	42
Total number of seats.....	634
Total weight..... tons..	90
Baggage cars.....	2
Total number of axles.....	8
Total freight capacity..... tons..	26
Total weight..... do.....	8
Freight cars in use.....	49
Total number of axles.....	98
Total freight capacity..... tons..	392
Total weight..... do.....	294

REPAIR SHOPS

There is one repair shop located at Santiago which employs 67 men when working to capacity. In November, 1929, 12 mechanics were employed. The shop is equipped with modern machinery and is sufficient for practically all repairing.

TRANSANDINO POR SAN MARTIN RAILWAY (PARTLY CONSTRUCTED)

(Transandine Railway via San Martin; Ferrocarril Los Lagos a Rinihue)

This line, originally owned and operated by the Sociedad Comercial y Ganadera General San Martin is located in southern Chile, extending from Los Lagos, where it connects with the State Railways and the port of Valdivia, to Lake Rinihue, a distance of approximately 40 kilometers. This was its length at the end of 1928. It is planned to continue construction through to San Martin de Los Andes, where it will connect with the Argentine State Railways. At the present time the railway maintains a through service twice a week between Los Lagos and Lake Rinihue. The distance between Lake Rinihue and San Martin de Los Andes is now covered by means of boats and horses. In March, 1928, it was reported that the railway had been acquired by the Compañía Electro Siderurgica a Industrial de Valdivia. For data on this company, see under heading Lanco to Guahun Pass Railway.

OPERATING OFFICIALS AND PURCHASES

Purchases are made by Daniel Oliva M., who is the manager and purchasing agent of the line. Communications should be addressed to Mr. Oliva at Estación Los Lagos, Chile.

FINANCES

The company is capitalized at 1,500,000 pesos. The following table shows a comparison of the receipts and expenses of the railway for the calendar years 1918 to 1927, inclusive:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1919.....	163,758	155,487	8,271		1924.....	144,276	139,065	5,211	
1920.....	216,171	186,117	30,054		1925.....	229,146	209,127	20,019	
1921.....	196,377	176,898	19,479		1926.....	251,488	225,236	26,252	
1922.....	164,448	149,373	15,075		1927.....	225,643	207,859	17,783	
1923.....	147,339	201,270		53,931					

PASSENGER AND FREIGHT TRAFFIC

Complete data on passenger and freight traffic for this railway are not available. The number of passengers carried in 1921 was 3,081; 1926, 6,851; and 1927, 6,421. The number of tons of freight carried in 1926 and 1927 was 20,090 each year.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the railway is 1 meter.

Curves.—The minimum curve radius on the railway is 150 meters.

Grades.—There is a maximum upgrade of 3 per cent for 3,000 meters.

Ties.—The ties used are of roble pellin, secured locally, 1.80 by 0.20 by 0.125 meters, spaced 1,500 to the kilometer.

Rails.—Steel rails, weighing 20 kilograms to the meter in 10-meter sections, are used.

Fuel stations.—Coal is used for fuel. There is one coal station.

Water stations.—There are three water stations having a capacity of 75 hectoliters and spaced an average distance of 13.33 kilometers apart.

Culverts and small bridges.—There are five culverts and small bridges, having a total length of 65 meters.

Large bridges.—There are two large bridges having a total length of 100 meters.

Employees.—During the calendar year ended December 31, 1927, the railway employed 43 men.

Tunnels.—There are no tunnels in use.

MOTIVE POWER AND ROLLING STOCK

At the end of the calendar year 1928 the railway owned 2 small locomotives, 2 old passenger cars, and 14 freight cars, in addition to several small boats for operation on the lakes.

TRANSANDINO POR ANTUCO RAILWAY (PARTLY CONSTRUCTED)

(Antuco Transandine Railway Co. (Ltd.))

Under a law dated March 14, 1903, the Government of Chile authorized the construction of the Chilean section of a transandine line, which when completed will connect the ports of Talcahuano on the Pacific with Bahia Blanca on the Atlantic, a distance of 788 kilometers. The Chilean section of the line was to be constructed from Monte Aguila, located on the Southern Railway about 95 kilometers from Talcahuano, through Antuco to the frontier, a distance of about 35 kilometers. The Argentine section as authorized in law 8439 of October 12, 1911, is to connect at this point with the Buenos Aires Great Southern Railway. Under the terms of the Chilean concession, the government granted a subsidy of £200,000, which is to be paid at the rate of £1,000 per kilometer opened to traffic up to a total of £120,000, the remainder of £80,000, being paid when the line has been linked up with the Argentine system. The Chilean section was opened to traffic as far as Cholguan, a distance of 35 kilometers, in December, 1905, and since that time has been extended to kilometer 76, about 15 kilometers east of Trupan, to which the line was completed in August, 1908. At the end of the calendar year 1927 the railway had 80 kilometers of track in operation, which included 4 kilometers of sidings. The railway is a Chilean organization and was capitalized, as of December 31, 1927, at 2,901,500 pesos.

PURCHASES

Information regarding purchases can be had by addressing the general manager, Lionel Edwards, in care of the railway at Monte Aguila.

FINANCES

The following table shows the receipts and expenses for the calendar years 1918 to 1927, inclusive:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	281,058				1923.....	144,853	144,812	41	
1919.....	59,398	39,756	19,642		1924.....	153,732	147,558	6,174	
1920.....	218,268	222,579		4,311	1925.....	172,858	183,155		10,297
1921.....	185,802	164,091	21,711		1926.....	226,611	185,052	41,559	
1922.....	135,597	154,947		19,350	1927.....	243,995	262,973		18,977

NOTE.—Data from Anuario Estadístico de la República de Chile.

TRAFFIC

The freight and passenger traffic of the railway for the calendar years 1918 to 1927 are as follows:

Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried
	<i>Tons</i>			<i>Tons</i>			<i>Tons</i>	
1918.....	7,525	16,695	1922.....	7,513	14,060	1926.....	9,788	18,046
1919.....	6,264	14,319	1923.....	9,190	15,674	1927.....	11,734	18,329
1920.....	8,924	17,029	1924.....	9,082	14,524			
1921.....	10,387	17,777	1925.....	10,170	17,366			

NOTE.—Data from Anuario Estadístico de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The railway is of 1-meter gage throughout.

Altitude.—The railway runs from 113 meters above sea level at Monte Aguila to 500 meters at Trupan, the highest point on the line.

Curves.—The radius of the shortest curve on the line is 150 meters.

Grades.—The maximum up grade is 25 per 100 for a distance of 500 meters, while the maximum down grade is 20 per 100 for 520 meters.

Rails.—Steel rails in 12-meter sections, weighing 25 kilograms per meter, are used.

Ties.—Wooden ties, of roble pelling 1.80 by 0.20 by 0.15 meters, spaced 1,600 to the kilometer, are used.

Culverts and small bridges.—There are 32 culverts and small bridges, with a total length of 76 meters, along the right of way.

Tunnels.—There are no tunnels in use.

Bridges.—There are five large bridges with a total length of 65 meters.

Water stations.—There are four water stations with a total capacity of 860 hectoliters, with an average distance between stations of 19 kilometers.

Fuel stations.—There is one coal station with a capacity of 360 tons.

Maintenance.—The railway is kept in fair condition.

Propulsion.—Steam is the power used for locomotion.

Employees.—During the calendar year 1927, the railway employed 54 men.

MOTIVE POWER AND ROLLING STOCK

The motive power and rolling stock owned by the railway on December 31, 1927, consisted of 3 locomotives, 4 passenger cars, and 37 freight cars.

GENERAL CRUZ TO PEMUCO RAILWAY (PARTLY CONSTRUCTED)

(Ferrocarril General Cruz-Cartago)

The history of this railway dates from February 19, 1909, when a concession was granted to Zenon Mendez to construct a railway from the station of General Cruz on the State Railways through the towns of Pemuco and Cartago to the region known as the Camarico, a total distance of 60 kilometers. The concession, while valid for a period of 90 years, contained a provision whereby the concessionaire, upon completion of the railway, would be reimbursed for all duties paid on construction material imported by him, provided its value was less than 150,000 gold pesos. In addition a bonus of 5,000 gold pesos for each kilometer delivered to service was promised with the provision that the amount would be increased to £1,000 per kilometer if in its prolongation the railway should become a trans-Andean line and connect with an Argentine railway serving an Atlantic port. Construction work began in August, 1907, previous authority having been granted to Mr. Mendez to begin construction work before the concession was actually granted. The railway was opened for service to Pemuco, a distance of 25 kilometers, in November, 1908, and extended to Cartago, a distance of 50 kilometers from General Cruz, in 1909. The railway was later increased by 6 kilometers in view of the demand for transportation created by the lumber industries in the region of the Camarico.

Since that time apparently the line from Pemuco to Cartago and beyond has ceased operation, as all official Government reports now show the railway as being operated to Pemuco only, a distance of 25.20 kilometers. The latest data being for December 31, 1927, the remainder of this discussion is devoted to this 25-kilometer section.

OPERATING OFFICIALS AND PURCHASES

The general manager of the company is Roberto Spranle, who should be addressed at San Javier, Chile. All purchases are made direct by him.

FINANCES

At the end of the calendar year 1927 the railway was capitalized at 80,000 pesos. The operating revenue and expenses of the railway during the calendar years 1918 to 1927, inclusive, were as follows:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918	90,000	60,000	30,000	-----	1923	122,817	125,808	-----	2,991
1919	59,445	30,372	29,073	-----	1924	34,842	58,596	-----	23,754
1920	82,500	84,297	-----	1,797	1925	37,915	44,485	-----	6,570
1921	122,817	125,808	-----	2,991	1926	51,778	43,085	8,693	-----
1922	122,817	125,808	-----	2,991	1927	53,364	44,500	8,864	-----

NOTE.—Data from Anuario Estadístico de la República de Chile.

TRAFFIC

The following table indicates the number of passengers and amount of freight carried by the railway during the calendar years 1918 to 1927, inclusive.

Year	Freight carried	Passen- gers car- ried	Year	Freight carried	Passen- gers car- ried	Year	Freight carried	Passen- gers car- ried
	<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>
1918-----	3,000	10,000	1922-----	4,535	4,824	1926-----	2,408	3,782
1919-----	2,683	2,097	1923-----	(1)	2,377	1927-----	1,735	5,962
1920-----	3,430	5,543	1924-----	1,951	4,877			
1921-----	4,525	4,824	1925-----	2,807	2,978			

¹ No data.

NOTE.—Date from Anuario Estadístico de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The railway runs from 101 meters above sea level at General Cruz to 178 meters at Pemuco, the highest point on the line.

Gage.—The gage of the railway is 1 meter.

Grades.—The maximum up grade is 5 per 100 for 100 meters, while the maximum down grade is 2.5 per 100 for 25 meters.

Curves.—The radius of the minimum curve on the line is 40 meters.

Rails.—Steel rails, weighing 12 kilograms per meter, in 7-meter sections, are used.

Ties.—Ties of roble pellin, secured locally, 1.80 by 0.20 by 0.125 meters and spaced 1,400 to the kilometer, are used.

Water.—There are three water stations, with a total capacity of 60 hectolitres, located 8 kilometers apart.

Fuel.—Coal is used for fuel. There is one coal station with a capacity of 10 tons.

Maintenance.—The railway is kept in fair condition.

Employees.—The railway employed 10 men during the calendar year 1926.

Tunnels.—There are no tunnels in use.

Culverts and small bridges.—There are 32 culverts and small bridges along the railway, having a total length of 98 meters.

Bridges.—There are two large bridges, having a total length of 24 meters.

MOTIVE POWER AND ROLLING STOCK

The motive power and rolling stock in operation by the railway at the end of the calendar year 1927 was as follows:

Locomotives-----	2	Auto-rail cars-----	2
Passenger cars:		Freight cars:	
First class-----	1	Flat-----	5
Second class-----	1	Special-----	2

TRANSANDINE RAILWAY VIA LONQUIMAY (PROPOSED)

(Ferrocarriil Transandino Por Lonquimay)

Another projected transandean line will extend from Curacautin on the southern section of the central railway system, about 216 kilometers south of Monte Aguila, through Lonquimay to Zapala, a point on the Argentine Great Southern Railway, and thus afford through communication to Bahia Blanca. According to reports in March, 1928, construction of this line is to be commenced during 1932. It is estimated that the line will be about 155 kilometers in length.

In February, 1929, reports were current that a Swedish capitalist, Heine Holmgren, has submitted an offer to the Chilean Government to construct a railway from Puerto Aysen to President Ibanez Bay, a distance of 300 kilometers, at a cost of 56,000,000 pesos. This is in the region through which the Lonquimay project would operate.

It is stated that considerable shale oil-bearing deposits worthy of development are located in this region.

This is the same project which the Chile Shale Oil Products Corporation late in 1925 offered to construct and turn over to the Government on its completion at a cost plus 15 per cent basis. The above company at that time was contemplating the distillation of bituminous schist in Lonquimay and Imilac.

LANCO TO GUAHUN PASS RAILWAY (PROPOSED)

(Lanco to Portezuelo Railway; Compañía Electro Siderurgica a Industrial de Valdivia)

In September, 1927, the Chilean Government granted a concession to Godofredo Oettinger and Victor Leon Munoz of Valdivia, Chile, which authorized them to construct and operate a railway from Lanco, a station on the main line of the southern branch of the State-owned railway, approximately 25 miles north of Valdivia, to Guahun, a



FIGURE 39.—American train on Transandine Railway

village located on the Chile-Argentine boundary line. The railway as proposed will consist of three sections approximately 46 miles in length and be of 1.60-meter gage. The first section of the line will connect Lanco station with the northwest shore of Lake Panguipulli, a distance of 51 kilometers, the second section will extend the line from Molco, located on the southeast shore of the same lake, to Puerto Pui on the northwest shore of Lake Pirehueico, 18 kilometers in length, while the third section will extend from the village of Pirehueico to Guahun Pass, a short distance from the northwest shore of Lake Lacar. Under the terms of the concession final plans and estimates for the construction of this railway must be presented to the Government within 28 months from the date of this concession. At the expiration of this time construction work must be commenced within the following six months. It is estimated that the first section will be completed within 2 years, the second in 4 years, and the third in 6 years. The concessionaries must deposit a guarantee of 50,000 pesos upon the presentation of the final plans and estimates.

Apparently the above terms have been complied with for in March, 1928, the Buenos Aires press reported the organization of a new company, known as the "Compañía Electro Siderurgica a Industrial de Valdivia," with headquarters in Valdivia. It has a subscribed capital of 26,000,000 pesos and a further issue of bonds to the amount of 30,000,000 pesos by Blair & Co. of New York City, on which the Chilean Government guarantees annual interest at 6 per cent with 1 per cent amortization. It is further reported that the railway will be electrically equipped and will obtain power from the Huilo-Huilo Falls, which the company has acquired under a concession from the Chilean Government extending for a period of 60 years. This company is reported to have already made extensive purchases of rolling stock and materials and to have purchased the Transandino por San Martin Railway with all its equipment. In view of this recent organization, it is assumed that the line will make use of the 40 kilometers of track already in operation by the Transandino por San Martin Railway and not follow out its original intentions of starting its line at Lanco, Guahun being the border termini for both transandine projects.

A copy of the concession which authorizes the construction of this line is as follows:

ARTICLE 1. Permission is granted, without interference of a third party, to Messrs. Godofredo Oettinger and Victor Leon Munoz to construct and exploit a railway between Lanco Station of the southern zone and Guahun Pass, situated on the Chile-Argentine boundary.

The railway shall be composed of three sections, the first uniting Lanco station with the northwest shore of Lake Panguipulli, the second with Molco, situated on the southwest shore of the same lake, with Puerto Pui, on the northwest shore of Lake Pirihueico, and the third, from the village of Pirihueico with Guahun Pass, a short distance from the northwest shore of Lake Lacar.

ART. 2. Granting the concessionaires at the same time the necessary permission to establish a navigation service on the Panguipulli and Pirihueico Lakes, with the object of obtaining the continuance of the traffic between Lanco and Guahun.

ART. 3. The present concession is granted in accordance with the dispositions of decree law No. 242 of March 13, 1925, complementary decree laws, and law No. 311 of March 5, 1920, and the concessionaires are consequently bound to said dispositions in relation to the construction and exploitation of the railway, transportation on the lakes, and all other obligations imposed by these laws, as well as to all the regulations, which for the application of the said decree laws are dictated and the legal and regular dispositions that may be established in future concerning them.

ART. 4. The gage of this railway shall be 1.60 meters and the length approximately 51 kilometers for the Lanco-Panguipulli section; 18 kilometers for the Molco-Puerto Pui section, and 8 kilometers for the Pirihueico-Guahun section.

ART. 5. The definite plans and estimate of cost of the three sections of the railway and the port and lake facilities shall be submitted for the approval of the Government within 28 months, beginning from the date of their publication in the Diario Oficial (Official Gazette).

For the working plan the railway shall be considered in the category of general interest to which decree No. 447 of March 15, 1907, refers.

The standards of construction shall be those set forth in decree No. 396, of September 22, 1916, for the first-class railways of 1.60-meter gage, without prejudice to that which should be observed in this respect in accordance with article 13 of law No. 3611.

ART. 6. The work of construction of the railway shall begin within six months after the date of publication of the approval of the plans.

The work of the first, second, and third sections shall be finished in two, four and six years, respectively, after the same date.

Within the same terms, the port and lake facilities shall be finished and properly equipped so as to permit of a continuous and regular service between Lanco and Guahun.

ART. 7. The concessionaires shall present at the end of the construction a descriptive report of the work and amount of initial expenses, classifying the different sections under the following headings:

- (a) Expenditures for information, organization, and administration.
- (b) Expropriations or acquisition of lands.
- (c) Movement of earths and secondary tasks.
- (d) Special work.
- (e) Superstructure of the line.
- (f) Buildings, workshops, and complementary installations.
- (g) Telegraphs, signals, and apparatus for these services.
- (h) Installations of water supply.
- (i) Machinery and tools for the exploitation.
- (j) Equipment:
 - (a) Motor.
 - (b) For transportation of passengers.
 - (c) For transportation of freight.
 - (d) For transportation of company employees.

The part of initial expenses enumerated between (a) and (i), inclusive, shall be considered as the initial value of the railway, to which there is reference later on in the present decree.

The concessionaires shall give an account to the Government of all later investment in complementary works which increases the initial value of the railway.

ART. 8. The concessionaires shall be obliged to establish public service for transportation of passengers and freight in each of the sections beginning from the date on which the construction work of each is finished and accepted by the Government.

The obligation of a public service shall be extended to the piers and jetties and other installations for transportation on the lakes through which the continuance of the railway traffic shall be established by means of payment of rates and fares as approved by the President of the Republic.

The schedule of charges, time-tables, and rules relative to the exploitation of the railroad and its annexes shall be submitted for the approval of the President of the Republic, following receipt of information from the inspector general of railways whether the service shall be established by the initiative of the concessionaires or by resolution of the Government.

ART. 9. The rolling stock destined for interrailway service shall conform to the regulations that exist or shall be established in future. The concessionaires shall place this material into service at their expense upon six months' notice from the Government.

ART. 10. The concession shall be for 60 years, beginning from the date of the publication of this decree in the *Diario Oficial*, at the end of which term the lines and their dependencies, with all their installations and transportation and exploitation equipment, shall pass to the hands of the state, contributing to increase the general railway fund, there being no other charge against the state than the payment of the balance of the value of the complementary work, to which the final clause of article 7 of the present decree refers, and which results from that which is resolved in article 20 of the general railway law.

ART. 11. Should the railway reach the frontier or be connected with the Argentine railways the concession shall be subject to the conventions which the Government has entered into or shall enter into in future on international traffic and to the measures requiring the fulfillment of these conventions.

If the application of future conventions should cause economic damages to the concessionaires, the matter shall be adjusted between the parties concerned.

ART. 12. The concessionaires shall deposit a guarantee of 50,000 pesos (approximately \$6,000) to the order of the inspector general of railways at the time definite plans are submitted. The deposit shall be in cash, public-debt claims, or bonds.

The public-debt claims and bonds shall be calculated at a discount of 10 per cent in arriving at their commercial value.

This deposit shall serve to guarantee the accomplishment of the obligations imposed by the present decree in the part relative to the construction of the railroad. This guaranty shall affect the three sections in proportion to their length, and the return of each of these items shall take place upon the completion of each section and the Government's authorization is obtained for operation. For this purpose the partial guaranties are fixed at 28,000 pesos for the Lanco Panguipulli section, 18,000 pesos for the Molco-Puerto Pui section, and 4,000 pesos for the Pirihueico-Guahun section.

ART. 13. The guaranty of 4,550 pesos to the order of the inspector general of railways, which the concessionaires shall accompany with their request for the concession, shall be returned upon depositing the 50,000 pesos, to which article 12 of the present decree refers.

ART. 14. If the construction of the railway shall not be finished within the terms established, the concessionaires are liable to a fine for each month over the time given for the completion of the work, equivalent to 5 per cent of the half-month advances within which the work should have been completed.

ART. 15. In conformity with article 9 of the decree law No. 342, this decree shall not become effective until the concessionaires shall have deposited to the account of the general railway fund of the national treasury in Santiago the sum of 910,000 pesos for concession rights.

ART. 16. Within the term of 12 months, beginning from the date of publication of this decree in the *Diario Oficial*, the concessionaires shall form a *Sociedad Anonima Chilena*, to which article 16 of decree law No. 342 refers.

ART. 17. The inspector general of railways, in representation of the national treasury, within the term of three months beginning from the publication of this decree in the *Diario Oficial*, is authorized to sign with the concessionaires or with their duly authorized representatives the contract to which the present decree refers, previous to making the deposit referred to in article 15 of this decree. The concessionaires shall deliver certified copies of this contract to the ministry of public works and communications and to the inspector general of railways.

Let it be recorded, communicated, published, and inserted in the bulletin of The Laws and Decrees of the Government and noted in the office of the national properties section of the comptroller general of the Republic.

C. IBANEZ.

ORTIZ VEGA.

Further information relative to this concession can be obtained from the *ministerio de obras públicas y vias de comunicacion, sección ferrocarriles*, at Santiago, Chile.

THE NITRATE RAILWAYS

COMPAÑÍA DE SALITRES Y FERROCARRIL DE JUNIN

The contract for the construction of this railway was awarded May 7, 1890, to Brooking Child & Co., who turned it over on June 17, 1890, to the Compañía de Salitres y Ferrocarril de Junin. It was completed and opened to traffic in 1894. The railway was constructed to exploit the nitrate zone of Pisagua, and under the terms of the concession the Government has the right to acquire the road at any time. In this area of Chile the nitrate region rises a sheer 2,000 feet from the water's edge. Consequently it was necessary to install a plane railway to connect the Port of Junin with this plateau, a distance of approximately 1,230 meters. The railroad and inclined plane railway are operated in connection with each other and the rolling stock is interchangeable. The total trackage operated by the railway at the end of the calendar year 1927 was 108.2 kilometers. This total included the inclined plane railway, about 1 kilometer, the main line, Junin to the oficina Reducto, 51 kilometers, a branch of 17 kilometers to Aragon, and 39.2 kilometers of shorter branches to the oficinas of Victoria, Antonio, Compania, California, Sloga, Union, Parvenir or Pecuerdo, and Aguada.

OPERATING OFFICIALS AND PURCHASES

At the present time the road is owned and operated by Gibbs & Co., with main offices in Iquique. J. K. Scarr is the general manager and should be addressed in care of the railway at Caleta Junin, Chile. All purchases are made by private tender through Gibbs & Co., Iquique.

FINANCES

The capitalization of the railway in the calendar year 1927 was 11,003,384 pesos. The operating receipts and expenses have been as shown in the following table:

Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	4, 079, 169	3, 639, 216	439, 953	-----
1919.....	2, 386, 746	2, 448, 117	-----	61, 371
1920.....	3, 596, 220	3, 382, 170	214, 050	-----
1921.....	1, 015, 158	1, 964, 575	-----	949, 317
1922.....	805, 725	1, 179, 018	-----	373, 293
1923.....	2, 842, 530	3, 593, 814	-----	751, 284
1924.....	4, 939, 653	5, 784, 915	-----	845, 262
1925.....	1, 365, 417	1, 816, 305	-----	450, 888
1926.....	1, 358, 846	2, 281, 896	-----	923, 050
1927.....	800, 038	1, 903, 144	-----	1, 103, 105

NOTE.—Data Anuario Estadístico de la República de Chile.

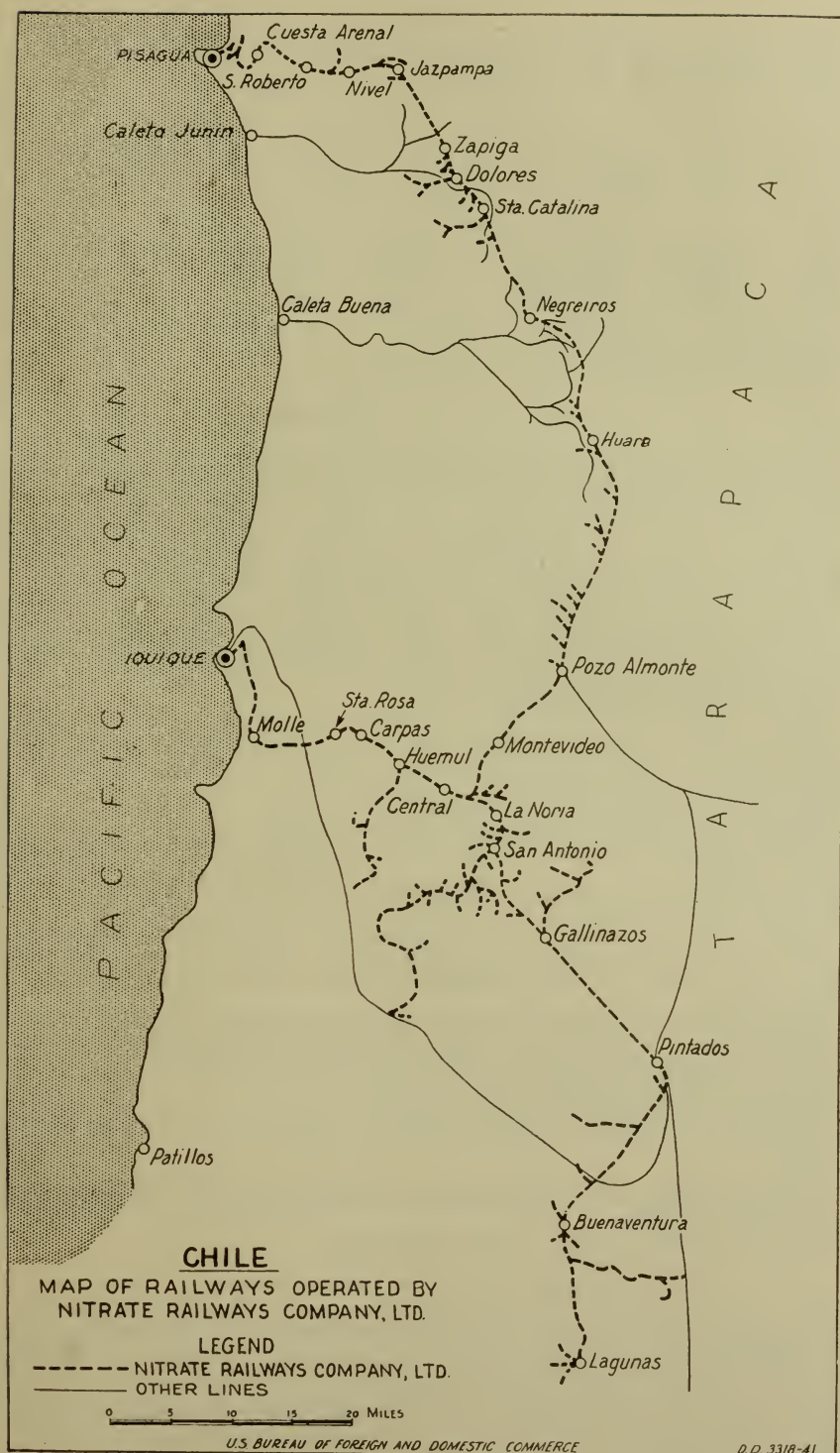


FIGURE 40

TRAFFIC

The freight and passenger traffic of the railway for the calendar years 1918 to 1927 was as follows:

Year	Freight carried	Passen- gers carried	Year	Freight carried	Passen- gers carried	Year	Freight carried	Passen- gers carried
	<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>
1918-----	109,360	2,500	1922-----	29,672	¹ 888	1926-----	51,277	1,055
1919-----	83,061	2,568	1923-----	62,143	435	1927-----	28,007	1,260
1920-----	65,050	1,240	1924-----	59,384	3,503			
1921-----	26,561	¹ 150	1925-----	61,179	1,117			

¹ Estadística de los Ferrocarriles de Chile en Explotación.

NOTE.—Data from Anuario Estadístico de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Cable section.—An inclined-plane railway was constructed in 1924 to connect the port of Junin at sea level with the plateau 674 meters (2,211 feet) above and 1,230 meters (4,035 feet) distant. It is operated by gravity, with compressed air available for starting if necessary. The cables are two improved Langs Lay construction cables of 6 strands, with 15 wires each and a hard-made Manila main core. It weighs approximately 3.9 kilos per meter and is 1¼ inches in diameter and 1.463 meters long. The average angle of the incline is 33° 30'.

Altitude.—From the plateau the railroad crosses two mountain chains, reaching a maximum elevation of 1,216 meters (nearly 4,000 feet). Casa Puente, 7 miles from Junin, is 3,100 feet above sea level; Cumbre, 12 miles, 3,989 feet; Los Pazos, 19 miles, 3,681 feet; Santa Catalina, 26 miles, 3,579 feet; and Reducto, 32 miles, is 3,740 feet above sea level.

Gage.—The gage of the road is 30 inches.

Grades.—The maximum up grade, exclusive of the inclined-plane section, is 30 per 100 for a distance of 14,500 meters, while the maximum down grade is 12 per 100 for 13,500 meters.

Curves.—The minimum curve radius is 100 meters.

Ballast.—Native clay, called chusca, is used for ballast.

Ties.—Ties of Chilean oak, 0.2 by 0.17 by 1.83 meters, spaced 1,450 to kilometer, are used.

Rails.—Steel rails weighing 17.5 kilograms to the meter, in 7.3-meter sections, are used.

Water.—Water is obtained from the railway's wells located at kilometer 30 and is stored in iron tanks along the right of way. There are four water stations with a total capacity of 1,400 hectoliters, located at an average distance apart of 22 kilometers.

Fuel.—California petroleum is used exclusively for fuel, and no change is contemplated in the near future. There are three oil stations with a total capacity of 30 tons located at an average distance apart of 30 kilometers.

Signals.—No signaling equipment is in use.

Clearance.—The right of way is 3 meters in width.

Maintenance.—The line is well maintained and able to carry all traffic that it is required.

Bridges.—There are five bridges with a total length of 246 meters.

Tunnels.—There are two unlined tunnels, cut through solid rock, having a total length of 170 meters.

Employees.—The railway employs 166 persons.

MOTIVE POWER AND ROLLING STOCK

During 1926 the railway owned 7 locomotives, 6 passenger cars, and 625 freight cars, the chief characteristics of which are furnished in the following paragraphs (according to the Estadística de los Ferrocarriles en Explotación for the year ended December 31, 1927, the railway had 11 locomotives, 5 passenger cars, and 496 freight cars).

Motive power.—Of the locomotives, 3 are Avonside locomotives, 2 of which were built in 1894 and 1 in 1895. The wheel arrangement is six drivers coupled and a pair of trailers. The wheel base is 7 feet and the diameter of driving wheels 36 inches. The weight of the locomotives is 32 tons each, having a tractive effort of 15,277 pounds, with a maximum load of 68 tons. Cylinders are 14 inches in diameter and 20-inch stroke. The water capacity is 800 gallons, and the fuel capacity is 1.3 tons. Two are Avonside locomotives built in 1895 and two are Yorkshire locomotives built in 1904, and have the following characteristics: Wheel arrangement, six drivers coupled and a pair of trailers; wheel base, 6 feet 9 inches; diameter of wheel, 33 inches; weight, 30 tons in working order; tractive effort, 11,766 pounds; maximum load, 52 tons; cylinders, 13 inches in diameter and 16-inch stroke; water capacity, 800 gallons; fuel capacity, 1.25 tons. Two are Farlie patent double-ender locomotives built by the Yorkshire Engine Co. of Sheffield, in 1906. Wheel arrangement, two 6-wheeled bogies; wheel base, 6 feet; diameter of driving wheels, 30 inches; weight, 44 tons in working order; tractive effort, 23,607 pounds; maximum load, 93 tons; cylinders, 12½ inches in diameter and 16-inch stroke; water capacity, 1,600 gallons; fuel capacity, 1.5 tons.

Rolling stock.—The company has six passenger cars, divided as follows: 1 first class, 1 second class, 1 third class, 1 mixed first and second class, and 2 rail-motor cars. The freight cars include 510 flat cars for nitrate, weighing 2½ tons each, with a carrying capacity of 7 tons. Their wheels are 24 inches in diameter and the wheel base is 6 feet. They are of iron and timber framework of the cane-car type and equipped with hand brakes.

These cars can be used on the inclined plane at Junin. In addition, there are 6 gondola cars, 8 box cars, 8 flat cars, 62 oil-tank cars weighing 3½ tons of 6 tons carrying capacity, 13 water-tank cars of the same construction as the oil-tank cars, and 18 all-iron cars weighing 4 tons each with a carrying capacity of 7 tons.

Couplers.—Couplers on all cars are 26 inches from the center of the track, and are of the center spring buffer type with ring and hook couplings.

REPAIR SHOPS

The company maintains one repair shop on the plateau at the head of the inclined plane in which are employed 47 persons. It is equipped to handle castings weighing up to 3 tons. Repairs are made on an average of 2 locomotives and 72 cars each year. All purchases for the shops are made direct by private tender to Gibbs & Co., Iquique, Chile.

COMPAÑÍA DE SALITRES Y FERROCARRIL DE AGUA SANTA

(Chilean Nitrate Railway Co.; Caleta Buena á Agua Santa Railway)

The history of this line dates from December 4, 1889, when a concession was granted by the Government for its construction. The Compañía de Salitres y Ferrocarril de Agua Santa was incorporated in Chile in 1890 and took over this concession and received additional concessions for new branches on March 19, 1890, January 3, 1892, and May 8, 1897. The main line of the railway was built from Alto de Caleta to Agua Santa. At the present time it has 144.9 kilometers of track in operation. From Alto de Caleta to Caleta Buena it was

necessary to construct an inclined-plane railway a distance of 2,133 meters in order to connect the main line with the port. This inclined-plane section now consists of three planes, each having three stages, with a total vertical height of 745 meters and an average angle of elevation of about 35°. The cars are operated solely by gravity, the heavily loaded downward car lifting the empty or lightly loaded upward car, all movement being controlled by powerful brakes acting upon the drum around which the cable is wound. In the operation of one of the planes there is in use a flexible steel wire rope. It is in three sections with a diameter of 1 inch and a total length of 2,300 meters. On another plane the work is handled by three steel wire ropes, 1 inch in diameter and a total length of 1,920 meters.

At the end of the calendar year 1927 the company had 144.9 kilometers of main-line track and 33.2 kilometers of branch track in operation and served approximately 20 nitrate plants. The railway is owned by the state and is leased and operated by the *Compañía de Salitres y Ferrocarril de Agua Santa*.

On February 10, 1929, the company suffered a loss of 920,000 pesos owing to a fire which practically destroyed the port of Caleta Buena. At that time it was estimated that shipments would not be interrupted for a period longer than two months.

OPERATING OFFICIALS AND PURCHASES

Operating officials of the line for the fiscal year ended June 30, 1927, are as follows:

President.—C. D. Finlay, Valparaíso, Chile.

Vice president.—Bertram Norton, Valparaíso, Chile.

Directors.—J. M. Bostelmann, Nicandor Senoret, and D. C. Duncan, all of Valparaíso, Chile.

General manager.—J. E. Lyon, Valparaíso, Chile.

Purchases for the road are made through the office of the company located at Casilla 210 in Iquique. These purchases are usually made by private tender.

FINANCES

The capitalization of the railway at the end of the calendar year 1927 was 24,000,000 pesos. The company has no funded obligations. The operating revenues and expenses of the railway for the calendar years 1919 to 1926 are as shown in the following table:

Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918	10,879,875	9,549,039	1,330,836	
1919	3,168,339	4,280,643		1,112,304
1920	7,179,711	5,510,028	1,669,683	
1921	2,159,172	2,800,974		641,802
1922	1,510,158	1,520,865		10,707
1923	3,273,747	2,340,036	933,711	
1924	6,056,301	4,160,955	1,895,346	
1925	4,997,289	3,800,721	1,196,518	
1926	2,279,922	2,411,413		131,491
1927	2,530,969	2,191,396	339,573	

[NOTE.—Data from *Anuario Estadístico de la República de Chile*.

TRAFFIC

The freight and passenger traffic of the railway for the calendar years 1918 to 1927 was as shown in the following table:

Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1918-----	7,650	471,554	1922-----	1,144	81,340	1926-----	20,261	127,137
1919-----	6,483	128,032	1923-----	7,190	149,286	1927-----	10,257	145,451
1920-----	17,407	278,099	1924-----	22,805	234,723			
1921-----	5,211	100,974	1925-----	13,088	215,322			

NOTE.—Data from Anuario Estadístico de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The highest point on the line is at Lagarto, which is 3,857 meters above sea level.

Gage.—The gage of the line is 0.762 meters.

Grades.—The maximum up grade of the main line is 3.03 per 100 for 700 meters, while the maximum down grade is 1.5 per 100 for 560 meters.

Curves.—The minimum curve radius of the line is 28 meters, lying between Alto Caleta and Estación Carmen.

Ballast.—The ballast used is of various materials. In certain places it consists of small rocks and in others of sandy soil.

Ties.—Ties of Chilean oak, secured from the south of Chile, 1.69 by 0.15 by 0.10 meters spaced 1,000 to the kilometer, are used.

Rails.—Steel rails weighing 18 kilograms to the meter, in sections of 7.31 meters, are used.

Water.—Water is obtained from wells on the pampa and is condensed at the nitrate plants for railway use. Circular iron tanks are used. There are five water stations at an average distance apart of 29 kilometers.

Fuel.—Fuel oil brought in tank steamers from Mexico and California is used as fuel. There are three fuel stations having a total capacity of 94 tons at an average distance apart of 48 kilometers.

Maintenance.—The railway is in good operating condition.

Bridges.—There are three bridges and culverts on the line, having a total length of 122 meters.

Employees.—The railway employs 244 persons.

Tunnels.—There are no tunnels on the road.

MOTIVE POWER AND ROLLING STOCK

At the end of the calendar year 1927 the road had in use 14 main-line locomotives and 5 small switch engines. Eleven of these were of the Baldwin 2-4-2 type and three Avonside 0-6-2 type. The weight in working order with tender is 23 tons, while the cylinders are 11 by 16 inches.

A total of 1,026 flat cars are in use. These are of the 4-wheeled car type, of strong wooden construction with vertical supports back and front, and strengthened with angle irons. These supports are necessary to prevent sacks of nitrate from rolling from the cars when placed on the inclined plane. The length of the cars is 3.40 meters, width 1.70 meters, and height of back and front framework is 1.10 meters. There are also 13 passenger coaches which include two auto-rail cars.

Couplers.—Link and pin couplers are used. The couplers are 500 millimeters from the center of the track.

REPAIR SHOPS

There is one repair shop located at Alto Caleta which is equipped with modern machinery for effecting necessary repairs to locomotives and cars. In connection with the shop is a foundry which can handle castings of iron or bronze up to a maximum weight of 4 tons. Generally there are about 70 workmen in the shop.

NITRATE RAILWAYS (LTD.)

(Iquique a Pisagua; Ferrocarril Salitreros de Tarapaca)

The history of the Nitrate Railways Co. (Ltd.) dates from June 11, 1860, when a concession was granted by the Peruvian Government (the territory in which the Nitrate Railways are located was formerly owned by Peru) to Federico Pezet and Jose M. Costa for the construction and operation of a railway between Iquique and La Noria. Under the terms of this concession the line was to revert to Peru 99 years from date. This concession lapsed and shortly afterwards, in 1864, a similar one was granted to Jose Pickering and Manuel Orihuela. In addition to the terms authorized in the original concession, this one contained a guaranty of 7 per cent interest on a capital investment of \$2,400,000. No work was accomplished under this contract and the concession passed into the hands of the Ramon Montero Bros. Co. During the period 1868 to 1871 the line was constructed from Iquique to La Noria by these concessionaires, a distance of 73 miles. It was known at this time as the Pisagua-Lagunas Railway and branches. Traffic over the line was inaugurated July 27, 1871.

This concession is due to expire in 1936. On May 18, 1869, the Ramon Montero Bros. Co. was granted an additional concession under the terms of which exclusive privileges for 25 years followed by 60 years of further exploitation were granted. Upon the expiration of this term the property is to revert to the State. This will occur in 1957. Under this concession the line was constructed from Pisagua to Zapiga, a distance of 90 miles. Under the terms of a third concession by the Peruvian Government, dated October 26, 1861, the Ramon Montero Bros. Co. was granted a concession to build certain branch railway lines as well as a highway to connect with the Bolivian border. The war of the Pacific occurred about this time, and at its conclusion this decree was not recognized by the Government of Chile and later was declared abrogated because the company failed to begin work within the time specified. The Nitrate Railways (Ltd.) was registered August 24, 1882, and took over the above-mentioned concessions with the consent of Chile, which now had control of the territory in which these lines were located. It has owned and operated the road since that time. Under a decree of May 6, 1890, it was granted a concession for the construction of an extension to the Lagunas nitrate deposit, and as a result constructed a railway 95 miles long which was opened to traffic in January, 1893. Under the terms of its construction the Government reserved the right to purchase the line at any time. It is understood that this concession will serve the Chilean Government as a means of purchasing, at the value declared for taxation, the entire system, should such a measure be required by public interests.

In 1913 a report was made to the directors of the railway on the feasibility of electrifying part of the line, and in 1918 definite recommendations for improving and electrifying the mountain section extending 20 miles from Iquique were made. A petition was presented to the Government asking for the necessary approval as well as the unification and extension of the period of the outstanding concessions which were very near expiring. After lengthy negotiations the Chilean Government issued a decree consolidating the various concessions and giving the company 50 years from 1922 in which to work its lines, in return for which the company agreed to spend about £800,000 in improvements and to electrify the Iquique section. When this decree was submitted to the Senate in September, 1923, it was rejected by one vote, and as a result the railroad decided

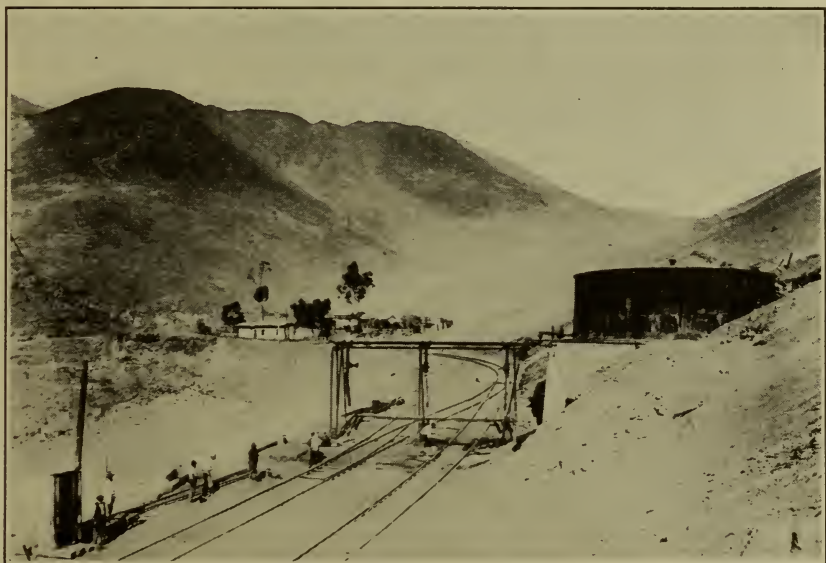


FIGURE 41.—Water station on Salitreros de Tarapaca Railroad

to abandon its electrification project. As of December 31, 1927, the company had 645.6 kilometers of main-line track and 107.7 kilometers of branch track in operation. This trackage comprises the original line running from Iquique to Central, a distance of 46.6 kilometers. At this point the railway divides into two sections, one line running north and the other south. The southern section ends at Lagunas, a distance of 94.9 kilometers from Central via Pintados where it connects with the Longitudinal Railway, although of a different gage, while the northern section extends from Central to Pisagua, a distance of 157.7 kilometers. The remainder is made up of various spur lines operating to the nitrate fields.

Port facilities are available at Iquique for shipping up to 3,000 tons of nitrate from the rail vehicles to lighters. The dock is equipped with two electrically operated portal cranes of $2\frac{1}{2}$ and 5 tons capacity.

OPERATING OFFICIALS AND PURCHASES

The operating officials of the railway for the calendar year ended December 31, 1928, were as follows:

Chairman.—A. W. Bolden, 110 Cannon Street, London, E. C. 4.
Secretary.—G. L. H. Axworthy, 110 Cannon Street, London, E. C. 4.
General manager.—A. T. Le Fevre, Iquique, Chile.
Local secretary.—George Wood, Iquique, Chile.
Resident engineer.—Gilbert M. Hunter, Iquique, Chile.
Locomotive superintendent.—Thomas Jefferson, Iquique, Chile.
Accountant.—J. C. Jenkins, Iquique, Chile.
Traffic manager.—C. E. Lee, Iquique, Chile.
Storekeeper.—A. Gibbons, Iquique, Chile.

Purchases are made both by public tender and private agreement, but final decisions and arrangements are made by the home office, 110 Cannon Street, London, E. C. 4. Certain purchases are made locally through the office of the company in Iquique.

FINANCES¹

“Authorized share capital, £5,796,000; issued and paid up, £3,304,340 (November 1, 1928). Share capital was increased from £1,200,000 to £1,380,000 in 1888, to £1,656,000 in 1890, to £3,312,000 by act of 1891, and to £5,796,000 in May, 1926 (by creation of ordinary £10 shares). In May, 1926, £1,242,000 of mortgage bonds redemption fund (included in capital account) was capitalized and allotted credited fully paid as bonus—15 new shares for every 20 unconverted ordinary; 5 new shares for every 20 preferred converted ordinary; and 10 new shares for every 20 deferred converted ordinary. Debit to capital account at December 31, 1927, £87,502, against which £87,502 has been set aside out of profits as ‘depreciation reserve account.’

“Undivided ordinary shares of £10, £2,448,780, fully paid (including £1,843,260 bearer shares). Price in official list—registered, 8; bearer, 8¼. Also quoted Glasgow, Liverpool, Manchester.

“Seven per cent preferred converted ordinary shares, £427,780. Price in official list, 7. Also quoted Glasgow, Liverpool.

“Deferred converted ordinary shares, £427,780. Price in official list, 1½. Also quoted Glasgow, Liverpool.

“*Conversion, dividend, and capital rights.*—By act of 1891, option was given to holders of £2,898,000 ordinary shares to require company to issue at any time new “preferred converted ordinary shares” and “deferred converted ordinary shares” against existing ordinary shares at rate of one preferred £10 share and one deferred £1 share for each ordinary undivided £10 share, thereby increasing nominal capital (if option to convert fully exercised) to £5,796,000. By act of 1901 shareholders have option of reconverting preferred and deferred converted ordinary shares in equal amounts into undivided ordinary shares. Dividend is declared on original capital (£2,898,000) as if undivided, and on amount accruing to divided portion preferred shares rank first for 7 per cent each year, balance going to deferred. In event of winding up, available assets will be distributed on original capital as if undivided, and out of amount falling to converted portion, preferred have priority for capital, balance going to deferred.”

The following table is a brief statistical summary of certain operating results for the period 1910 to 1926, inclusive:

¹ Stock Exchange Yearbook, 1929.

Year	Miles open	Traffic (thousands of tons carried)	Earnings		Year	Miles open	Traffic (thousands of tons carried)	Earnings	
			Gross	Net				Gross	Net
1910.....	269	2,343	£665,672	£339,945	1919.....	391	1,421	485,143	95,790
1911.....	377	2,290	642,329	324,285	1920.....	391	2,275	1,009,940	250,777
1912.....	377	2,405	685,326	349,258	1921.....	391	1,357	498,407	¹ 5,494
1913.....	385	2,402	724,048	372,829	1922.....	392	1,363	492,146	116,652
1914.....	391	1,815	559,569	263,237	1923.....	396	2,173	769,167	305,431
1915.....	391	1,283	394,786	199,355	1924.....	396	2,836	1,001,276	407,761
1916.....	391	2,321	704,025	352,287	1925.....	398	2,689	1,010,610	291,877
1917.....	391	2,530	794,651	286,064	1926.....	402	1,779	700,466	140,242
1918.....	391	2,606	841,197	152,395	1927.....	402	1,116	698,539	233,917

¹ Deficit.

The following table indicates the number of passengers carried over the line and the passenger revenue for the calendar years 1924, 1925, 1926, and 1927 inclusive:

Year	First-class passengers	Second-class passengers	Total passengers	Passenger revenue	Year	First-class passengers	Second-class passengers	Total passengers	Passenger revenue
1924.....	93,906	479,031	572,937	£58,058	1926.....	82,015	375,133	457,148	£52,588
1925.....	97,582	481,530	579,112	63,402	1927.....	46,423	241,101	287,524	35,616

The following statements are copies of the balance sheet, revenue account, and net revenue account for the calendar years 1926 and 1927:

BALANCE SHEET FOR THE YEAR ENDED DECEMBER 31, 1926

	£	s.	d.
Depreciation reserve account: Amount expended on capital account in excess of capital issued, set aside out of profits....	87,501	19	11
Reserve for new works.....	47,000	0	0
Reserve account.....	300,000	0	0
Amortization account.....	135,000	0	0
Contingencies reserve account.....	75,000	0	0
Renewals account.....	967	4	2
Insurance reserve account.....	50,000	0	0
Sundry creditors and credit accounts.....	132,576	4	8
Sundry creditors for unclaimed dividends.....	16,700	10	10
Net revenue account:	£	s.	d.
Balance per statement No. 3.....	157,392	18	4
Less interim dividend paid Nov. 11, 1926.....	43,470	0	0
	113,922	18	4
	958,668	17	11
Capital account: Balance over expended Dec. 31, 1926.....	87,501	19	11
Sundry debtors and debit accounts.....	69,317	19	2
Stores:	£	s.	d.
In hand.....	172,620	4	11
In transit.....	9,470	19	2
	182,091	4	1
Remittances in hand.....	50,000	0	0
Investments.....	493,448	4	4
(The market value Dec. 31, 1926, was £494,980.)			
Cash at banker's and in hand.....	76,309	10	5
	958,668	17	11

BALANCE SHEET FOR THE YEAR ENDED DECEMBER 31, 1927

	£	s.	d.
Depreciation reserve account: Amount expended on capital account in excess of capital issued, set aside out of profits..	87,501	19	11
Reserve account.....	300,000	0	0
Amortization account.....	165,000	0	0
Contingencies reserve account.....	75,000	0	0
Renewals and new works account.....	89,358	15	9
Insurance reserve account.....	50,000	0	0
Sundry creditors and credit accounts.....	56,807	9	10
Sundry creditors for unclaimed dividends.....	13,316	9	6
Net revenue account:	£	s.	d.
Balance per statement No. 3.....	219,353	17	7
Less interim dividend paid Nov. 7, 1927.....	43,470	0	0
	<hr/>	<hr/>	<hr/>
	175,883	17	7
	<hr/>	<hr/>	<hr/>
	1,012,868	12	7
Capital account: Balance over expended Dec. 31, 1927.....	87,502	19	11
Sundry debtors and debit accounts.....	51,542	5	2
Stores:	£	s.	d.
In hand.....	152,316	14	8
In transit.....	1,013	12	2
	<hr/>	<hr/>	<hr/>
	153,330	6	10
Remittances in hand.....	155,000	0	0
Investments.....	523,571	1	1
(The market value Dec. 31, 1927, was £528,757 17s. 0d.)			
Cash at banker's and in hand.....	41,922	19	7
	<hr/>	<hr/>	<hr/>
	1,012,868	12	7

REVENUE ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1926

DEBIT		£	s.	d.
Maintenance of way and works (A).....		123,929	17	3
Maintenance of locomotives (B).....		63,075	0	5
Maintenance of carriages, etc. (C).....		5,460	18	3
Maintenance of wagons, etc. (D).....		20,480	8	8
Locomotive running expenses (E).....		147,047	7	5
Vehicle running expenses (F).....		7,098	8	4
Traffic expenses (G).....		100,839	16	8
Moles and lighters (H).....		3,063	9	1
General expenses (I).....		74,318	11	6
Expenditure in London (J).....		14,909	16	0
Balance carried to net revenue account.....		140,242	17	2
		<hr/>	<hr/>	<hr/>
		700,466	10	9
CREDIT		£	s.	d.
Nitrate traffic.....		366,264	6	8
Coal and oil traffic.....		210,699	2	6
General cargo and luggage.....		56,322	0	3
Passengers.....		52,588	18	0
Sundry receipts.....		14,592	3	4
		<hr/>	<hr/>	<hr/>
		700,466	10	9

REVENUE ACCOUNT FOR YEAR ENDED DECEMBER 31, 1927

DEBIT		£	s.	d.
Maintenance of way and works (A).....		83,914	13	9
Maintenance of locomotives (B).....		58,148	3	1
Maintenance of carriages, etc. (C).....		5,334	8	6
Maintenance of wagons, etc. (D).....		13,576	10	3
Locomotive running expenses (E).....		117,839	8	2
Vehicle running expenses (F).....		7,909	11	4

	£	s.	d.
Traffic expenses (G).....	67,176	7	3
Moles and lighters (H).....	3,116	15	8
General expenses (I).....	93,161	1	7
Expenditure in London (J).....	14,444	19	1
Balance carried to net revenue account.....	233,917	13	6
	698,539	12	2
CREDIT			
	£	s.	d.
Nitrate traffic.....	479,699	14	11
Coal and oil traffic.....	133,655	9	1
General cargo and luggage.....	35,648	1	5
Passengers.....	35,616	8	3
Sundry receipts.....	13,919	18	6
	698,539	12	2

NET REVENUE ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1926

DEBIT			
	£	s.	d.
Balance of income tax.....	35,905	15	10
French taxes, etc.....	5,591	14	5
Expenditure on new sidings and buildings during 1926.....	39,420	1	9
Balance carried to balance sheet.....	157,392	18	4
	238,310	10	4
CREDIT			
	£	s.	d.
Balance from December 31, 1925.....	171,015	0	1
Less final dividend paid May 26, 1926.....	99,360	0	0
	71,655	0	1
Balance of revenue per statement No. 2.....	140,242	17	2
Balance of interest, discount, etc.....	26,220	18	9
Exchange.....	124	6	10
Transfer fees.....	67	7	6
	238,310	10	4

NET REVENUE ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1927

DEBIT			
	£	s.	d.
Balance of income tax, French taxes, etc.....	2,988	18	4
Expenditure on new sidings and buildings during 1927.....	20,308	0	0
Renewals and new works account.....	50,000	0	0
Amortization account.....	30,000	0	0
Balance carried to balance sheet.....	219,353	17	7
	322,650	15	11
CREDIT			
	£	s.	d.
Balance from December 31, 1926.....	113,922	18	4
Less final dividend paid May 10, 1927.....	43,470	0	0
	70,452	18	4
Balance of revenue per statement No. 2.....	233,917	13	6
Balance of interest, discount, etc.....	15,156	4	1
Exchange.....	3,046	10	0
Transfer fees.....	77	10	0
	322,650	15	11

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The line runs from 8 meters above sea level at Iquique to 1,125 meters at Jazpampa which is the highest point on the line.

Gage.—The railway is of standard gage 4 feet 8½ inches.

Grade.—The maximum up grade is 39.5 per 100 for 869 meters and maximum down grade 49.7 per 100 for 700 meters.

Curves.—The radius of the shortest curve on the line is 100 meters.

Ballast.—The greater part of the line is ballasted with sand and earth, although crushed stone is used in some sections.

Ties.—The ties used are of Chilean oak (roble pellin), secured in southern Chile, 6 by 10 inches by 8 feet, spaced on 2-foot centers.

Rails.—Steel flat-bottom rails, weighing 62, 65, 81, 83, and 85 pounds to the yard in sections of 24, 32, and 36 feet, are used.

Water.—Water is secured from the Tarapaca water works, and it is piped across the pampa from the foothills of the Cordillera. There are 26 tanks, with a total capacity of 62,515 hectoliters, located at the stations. These are entirely constructed of steel plates. At certain water stations the railway has its own wells, but the system is practically all supplied by means of the water works at Tarapaca. The average distance between stations is 22 kilometers.

Fuel.—At the present time coal and oil are used as fuel for the locomotives, while coal is used in the shops. There are 10 coal stations with a total capacity of 1,800 tons and 9 oil stations with a capacity of 1,800 tons. These stations are located an average distance of 29 kilometers apart.

Maintenance.—The railroad is kept in good condition.

Signaling.—Signaling is carried on by telegraph and telephones. Recently it has been decided to install Western Electric train control on the main lines of the railway, and it is expected that this system will be in operation shortly.

Employees.—For the calendar year ended December 31, 1927, there were 3,598 employees.

Bridges and tunnels.—There are five small bridges and culverts totaling 7 meters in length. There are no tunnels located on the line.

MOTIVE POWER AND ROLLING STOCK

The motive power and rolling stock operated by the line for the year ended December 31, 1913, consisted of 73 locomotives and 1,923 cars of various kinds; for the year ended December 31, 1927, it was as shown in the following statement:

Locomotives.....	70	Rolling stock—Continued:	
Rolling stock:		Freight cars—	
Passenger cars—		Wooden platform cars.....	351
First class passenger cars...	27	Iron and steel cars.....	921
Second class passenger		Test cars.....	2
cars.....	16	General service cars.....	5
Steam cars.....	3	Cattle cars.....	76
Inspection cars.....	3	Breakdown cars.....	3
Paymaster's cars.....	2	Explosive cars.....	2
Post office cars.....	8	Ballast cars.....	16
Motor inspection cars.....	4	Box cars.....	108
Motor inspection trolleys..	1	Petroleum tank cars.....	198
Motor ambulance cars.....	2	Water tank cars.....	22
Baggage cars.....	3	Maintenance cars.....	9
Total.....	139	Total.....	1,713

Couplers.—Both link-and-pin and M. C. B. automatic couplers are used. Couplers are placed at 2 feet 7 inches from the top of rails.

REPAIR SHOPS

There is one repair shop located at Iquique, which employs 500 men when working to capacity. The equipment available can handle castings weighing up to 3 tons, while the foundry has a capacity of one 10-ton casting per week. An average of 40 loco-

motives and 7,400 cars are repaired in this workshop during the course of the year. The shops are equipped with modern machinery and recently have been converted to electric drive. There is a new rolling-stock shop with sufficient accommodation for 180 cars. The roundhouse is equipped for 25 engines.

ANGLO-CHILEAN CONSOLIDATED NITRATE CORPORATION RAILWAY

(Tocopilla al Toco Railway)

The Anglo-Chilean Nitrate & Railway Co. (Ltd.) was registered on March 28, 1888, to acquire nitrate ground located in the Province of Antofagasta and to construct a railway and other works in connection with this acquisition. The concession granted to this company by the Government is dated January 20, 1888. Work on a railway to connect Tocopilla with Toco commenced immediately, and traffic was inaugurated on November 15, 1890, over the entire distance of 87.30 kilometers. A branch line to Santa Fe was constructed in 1895, while a branch to Coya was built in 1910, adding 64 kilometers of track to the line then in operation. In 1910 a branch was constructed from Coya to Vergara a distance of 9 kilometers. This mileage has since been augmented by a branch from Central to Maria Elena, a distance of 45 kilometers. The company was operated as originally organized until December 22, 1924, when the Anglo-Chilean Consolidated Nitrate Corporation was incorporated under the laws of the State of Delaware to acquire all the property of the Anglo-Chilean Nitrate & Railway Co. (Ltd.). This company, in which the Guggenheim Bros., of 120 Broadway, New York city, are interested, has operated the property up to the present time. The company had 210.5 kilometers of main-line track and 29.2 kilometers of branch track in operation at the end of the calendar year 1927. At the present time it is planned to construct an additional branch line from Coya Norte to the copper plant of the Chilean Exploration Co., at Chuquicamata, Chile, a distance of 90 kilometers, at an estimated cost of 30,000,000 pesos.

It is expected that considerable difficulty will be encountered in constructing this branch, as it is claimed that a great deal of traffic now moving through the port of Antofagasta will be diverted to the port of Tocopilla. Under the tentative plans the line is to be of 3 foot 6 inch gage, which is standard for all the track operated by the company, although it is understood that henceforth all railways constructed in that section of Chile will have to be of 1-meter gage and, if this is correct, will cause some changes in the original plans. The construction of this branch was still pending in 1927 and no reports have yet been received which indicate that it will be built in the near future. However, if it is constructed, it is estimated that there will be a prospective market for 15 locomotives of an average weight of 64 tons, 275 freight cars of 20 tons, and 60 tank cars of 30 tons each. All of this material will be purchased through the home office of the company at 120 Broadway, New York City.

In addition to this branch the company at the end of 1927 was electrifying a stretch of 39 kilometers of the Tocopilla to Toco section. Traffic will be handled by 6 locomotives; electric power will be supplied by six sets of Diesel engines with individual capacities of 1,250 kilowatts, located at the Oficina Maria Elena. Current

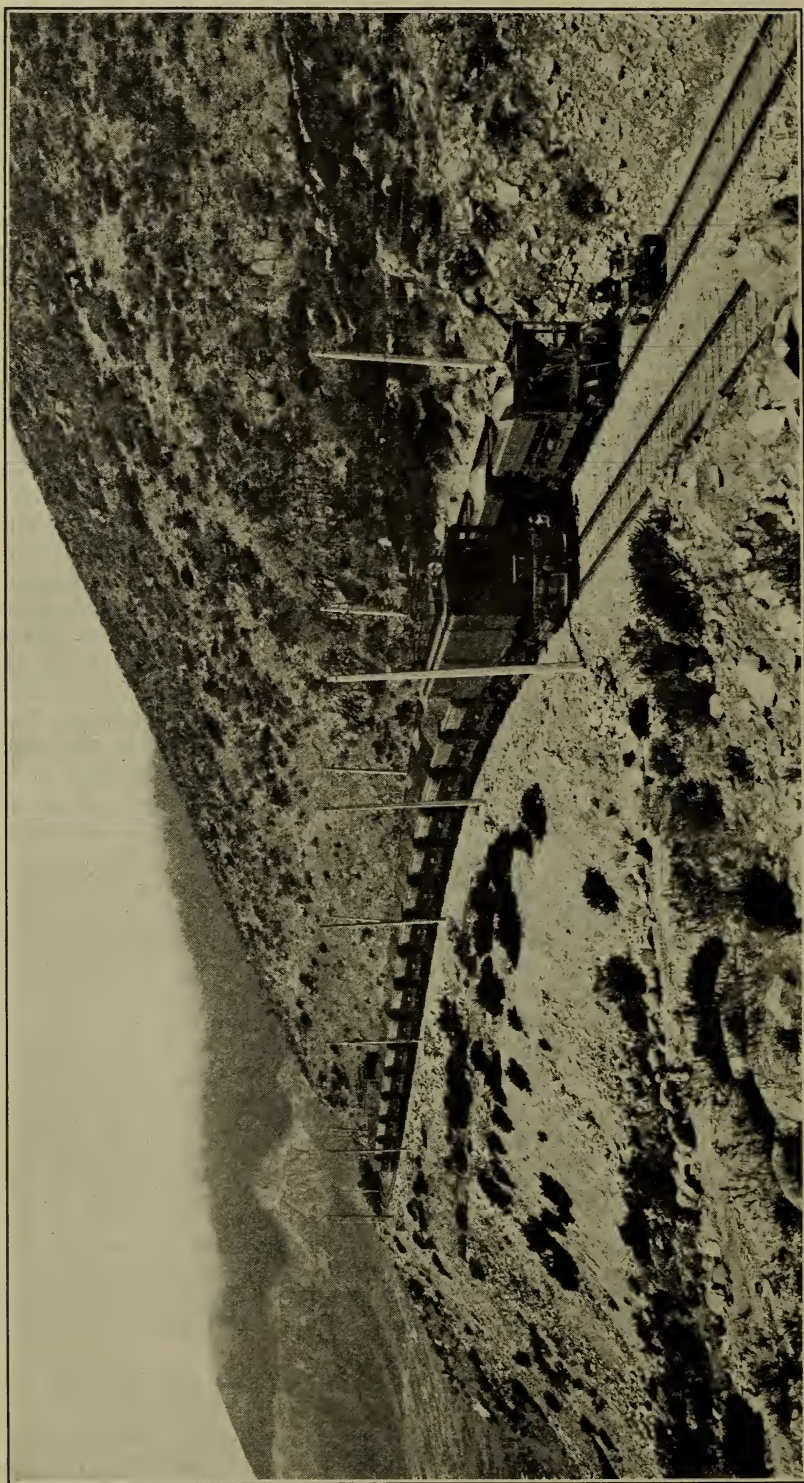


FIGURE 42.—Section of Tocopilla to El Tofó Railroad

at 33,000 volts will be transmitted to two substations, located at kilometers 4 and 33, respectively, for conversion to direct current of 1,500 volts. The posts are of American cedar.

OPERATING OFFICIALS AND PURCHASES

The operating officials of the railway for the calendar year 1927, were as follows:

President.—E. A. Cappelen Smith, 120 Broadway, New York City.
First vice president.—J. K. MacGowan, 120 Broadway, New York City.
Vice president.—Paul H. Mayer, 120 Broadway, New York City.
Consulting engineer.—C. Lalor Burdick, 120 Broadway, New York City.
Secretary.—W. E. Bennett, 120 Broadway, New York City.
Director of purchases.—E. R. Reets, 120 Broadway, New York City.
General manager.—Robert Marsh, jr., Tocopilla, Chile.
Civil engineer.—A. H. Street, Tocopilla, Chile.
Traffic manager.—W. J. McGowran, Tocopilla, Chile.

Purchases are made through the main offices of the corporation (Guggenheim Bros.) at 120 Broadway, New York City. Minor purchases are made by J. J. Lennon, the purchasing agent of the company located at Valparaiso, Chile.

FINANCES

The railway is capitalized at 74,976,120 pesos. The operating revenues and expenses for the calendar years 1918 to 1927 are as shown in the following table:

Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	8,347,326	6,104,322	2,243,004	-----
1919.....	4,531,614	4,451,328	80,286	-----
1920.....	17,658,816	12,338,871	5,319,945	-----
1921.....	9,578,199	9,711,747	-----	133,548
1922.....	9,275,598	7,252,716	2,022,882	-----
1923.....	12,828,546	8,478,036	3,350,510	-----
1924.....	12,748,200	9,106,221	3,641,979	-----
1925.....	15,216,379	13,724,501	1,491,878	-----
1926.....	14,287,728	15,416,805	-----	1,129,077
1927.....	17,500,308	16,683,852	816,455	-----

NOTE.--Data from Anuario Estadístico de la República de Chile.

TRAFFIC

The passenger and freight statistics of the company for the calendar years 1918 to 1927 are as shown in the following table:

Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried
	<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>
1918.....	252,931	27,488	1922.....	242,656	16,285	1926.....	300,066	49,203
1919.....	151,477	20,344	1923.....	304,678	25,601	1927.....	627,042	33,421
1920.....	379,004	39,583	1924.....	331,024	34,407			
1921.....	231,388	23,822	1925.....	355,151	53,645			

NOTE.—Data from Anuario Estadístico de la República de Chile,

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The road runs from a minimum elevation above sea level of 16 feet to 4,902 feet, which is the highest point on the road.

Gage.—The gage of the road is 3 feet 6 inches (1.067 meters).

Grade.—The main line has a maximum grade of 4 per cent, while the branches have grades up to but not exceeding $1\frac{1}{2}$ per cent. The principal gradients are one of 4 per cent for 17 miles, a 9-mile grade of $2\frac{1}{2}$ per cent, and a 20-mile grade of $1\frac{1}{10}$ per cent.

Curves.—The radius of the smallest curve on the road is 181 feet.

Ballast.—Local material is used for ballast.

Ties.—Ties 2.13 by 0.25 by 0.13 meters of Chilean oak, secured in southern Chile, spaced 1,430 to the kilometer, are used.

Employees.—At the end of the calendar year 1927 there were 2,141 employees.

Rails.—Standard rails, weighing 48 pounds in 24-foot sections, and 60 pounds in 30-foot sections, are used.

Water.—Water used by the railway is secured from various sources. In the ports condensed sea water is used, as compared with river water in the pampa.

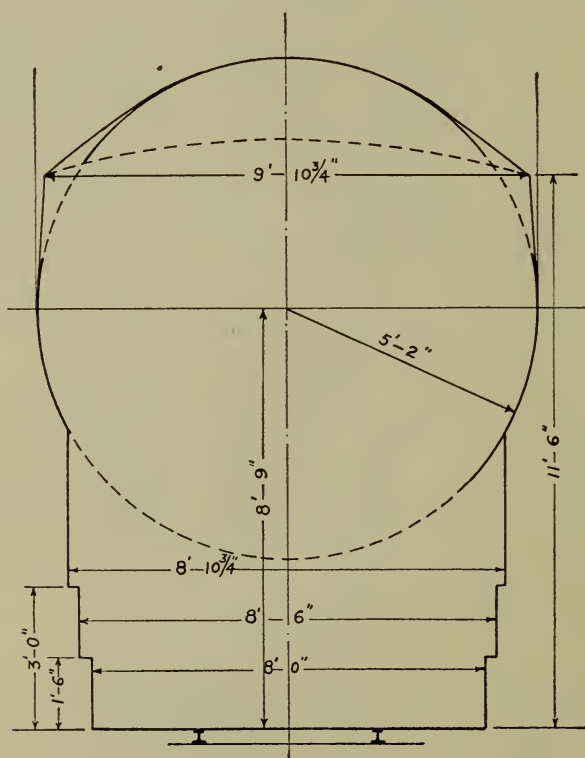


FIGURE 43.—Clearance diagram, Anglo-Chilean Nitrate Railways Corporation

Water stations are spaced from 4.8 to 16 kilometers apart, all water being stored in tanks constructed of riveted iron plates.

Fuel.—Residue petroleum, secured from California, is used as fuel. Fuel stations are located from 28 to 60 kilometers apart.

Signaling equipment.—Hand flags are the only type of signaling equipment used.

Clearance.—The accompanying diagram shows the maximum clearance of the railway.

Maintenance.—The railway is kept in good condition and is able to handle all the traffic required.

Bridges.—There are two short bridges located one each on the Santa Fe and Cova branches.

Tunnels.—There is one tunnel, 40 meters in length, located on the main line at kilometer 17.7. This tunnel has been excavated through hard rock.

MOTIVE POWER AND ROLLING STOCK

Motive power.—The locomotives operated during the calendar year 1927 were as shown in the following table:

Number	Make	Cylinders			Boiler						
		Di-am-eter	Stroke	Inter-nal di-ameter	Heating surface			Tubes			Area of grate
					Firebox	Tubes	Total	Out-side di-am-eter	Length	Quantity	
		<i>Inches</i>	<i>Inches</i>	<i>Ft. in.</i>	<i>Sq. ft.</i>	<i>Sq. ft.</i>	<i>Sq. ft.</i>	<i>Inches</i>	<i>Ft. in.</i>	<i>Num-ber</i>	<i>Sq. ft.</i>
3	Kitson.....	17	21	4 3	93.15	881.65	974.8	13½	11 3	174	16.00
2	do.....	17	21	4 2	93.15	876.59	969.74	13½	11 3	173	16.00
4	do.....	14	18	4 4	104.00	1,042.56	1,146.56	13½	11 3	206	25.68
4	do.....	14	18	4 3	104.00	1,042.00	1,146.00	13½	11 3	206	25.68
5	do.....	4	18	3 9	62.00	574.00	636.00	13½	9 11½	128	11.2
5	do.....	4	18	3 9	62.00	648.00	710.00	13½	12 2¼	128	11.2
1	Manning Wor-										
	de & Co.....	16	24	4 2	103.00	933.00	1,036.00	13½	12 2½	158	15.0
1	do.....	10½	16	2 2	31.9	271.5	303.4	2	8 4½	64	5.0
1	do.....	10½	16	2 0	27.0	155.7	182.7	2	8 9	34	3.8
2	Kitson.....	11	18	3 2	50.3	374.00	424.3	13½	8 6	98	8.3
2	Avonside En-										
	gine Co.(Ltd.)	11	18	3 2¾	51.0	374.00	425.00	13½	8 5¾	96	8.3
4	Kitson.....	15	21	5 1½	126.218	1,528.64	1,654.858	13½	12 1	281	34

Number	Make	Tank contents			External size of locomotives			Diameter of wheels	
		Water	Coal	Liquid fuel	Length outside buffers	Outside breadth	Height from rail to top of chimney	Drivers	Truck or bogie
		<i>Gallons</i>	<i>Tons</i>	<i>Cu. ft.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>
3	Kitson.....	2,070	2	80	35 1	8 4 $\frac{1}{2}$	12 6	3 2 $\frac{1}{2}$	2 1 $\frac{1}{2}$
2	do.....	2,070	2	80	35 1	8 4 $\frac{1}{2}$	12 6	3 2 $\frac{1}{2}$	2 1 $\frac{1}{2}$
4	do.....	2,040	110	80	36 9 $\frac{1}{2}$	8 4	12 10	2 10 $\frac{3}{4}$	2 10 $\frac{3}{4}$
4	do.....	2,040	110	80	36 9 $\frac{1}{2}$	8 4	12 10	2 10 $\frac{3}{4}$	2 10 $\frac{3}{4}$
5	do.....	1,000	1.47	65	28 5	7 6	12 4	2 10 $\frac{3}{4}$	2 1 $\frac{1}{2}$
5	do.....	1,000		65	28 11 $\frac{3}{4}$	7 6	12 3	2 10 $\frac{3}{4}$	2 1 $\frac{1}{2}$
1	Manning Wor-								
	de & Co.....	4,050		510	32 9	8 8	12 6	3 2	2 1
1	do.....	350	0.37	18	11	7 3 $\frac{3}{4}$	10 2 $\frac{3}{4}$	2 9 $\frac{3}{4}$	2 5
1	do.....	295.8	1 10	112	30 7	8 4	12 0	2 9 $\frac{3}{4}$	2 5
2	Kitson.....	600	3 $\frac{1}{4}$	24	1 $\frac{1}{2}$	7 6	10 8 $\frac{1}{2}$	2 10 $\frac{3}{4}$	2 1 $\frac{1}{2}$
2	Avonside Engine Co.								
	(Ltd.).....	600	2 35	25	24 3	7 6	10 8 $\frac{1}{2}$	2 10 $\frac{3}{4}$	2 1 $\frac{1}{2}$
4	Kitson.....	2,500	130	95	46 5	8 10	12 10	3 2 $\frac{1}{2}$	2 1 $\frac{1}{2}$

¹ Hundredweight.

² Cubic feet.

Rolling stock.—The rolling stock operated by the line during the calendar year 1927 was as follows:

High side steel cars.....	74	Passenger bodegas (20 passengers each).....	3
High side wooden cars.....	5	Oil tank cars.....	56
Low side steel cars.....	196	Second-class passenger coaches (46 passengers each).....	4
Bodega steel cars.....	50	Special inspection coaches (10 passengers each).....	2
Wooden flat cars.....	25		
Steel flat cars.....	81		
Tubular steel low side cars.....	5		
Wooden low side cars.....	65		
Composite passenger coaches (48 passengers each).....	5	Total.....	571

REPAIR SHOPS

There is one repair shop located at Tocopilla, which, when working to capacity, employs 206 men. The shop is equipped with a foundry having a 3-ton cupola. The largest casting which can be handled is 2 tons. The following is a list of the power-driven tools in the machine shop:

- 1 double wheel lathe for 4-foot 6-inch diameter wheels.
- 1 double wheel lathe for 4-foot diameter wheels.
- 1 screwing and tapping machine, $\frac{1}{4}$ to 2 inch diameter.
- 1 horizontal boring machine.
- 1 planing machine, 2 feet 6 inches by 2 feet 6 inches by 6 feet, single head.
- 1 shaper, 12-inch stroke.
- 1 shaper, 14-inch stroke.
- 1 shaper, 20-inch stroke.
- 1 slotting machine, 10-inch stroke.
- 1 screwing machine for 2 to 6 inch diameter pipes.
- 1 wood turning lathe, 24-inch swing.
- 1 tyre drilling machine.
- 2 high speed sensitive drilling machines.
- 1 radial drilling machine, 3 feet 6 inches.
- 1 radial drilling machine, 4 feet.
- 1 surfacing, boring, and screw cutting lathe, 30 inches.
- 2 sliding, surfacing, and screw cutting lathes, 18-inch swing.
- 3 sliding, surfacing, and screw cutting lathes, 12-inch swing.
- 1 vertical boring mill, 30 inches.
- 1 sliding, surfacing, and screw cutting lathe, 21-inch swing.
- 1 hexagon turret lathe, $2\frac{1}{2}$ by 30 inches.
- 1 capstan lathe, 14 inches.
- 1 capstan lathe, 2-inch hollow spindle.
- 1 rod or bar straightener for bars $\frac{3}{8}$ to $1\frac{1}{4}$ inch diameter.
- 1 cold saw (circular).
- 1 power hack saw.
- 1 surface grinder.
- 1 link and bush grinder.
- 1 twist drill grinder.
- 1 tool grinder.
- 1 universal grinder.
- 1 grindstone, 48 by 8 inches.

THE TALTAL RAILWAY

(Ferrocarril Taltal)

The history of this railway dates from 1872 when its construction was first considered. However, it was not until November 14, 1878, that a law was enacted which authorized its construction. The original concession was granted to Alfredo Quaet Falsen, in perpetuity, and carried no monetary guaranty. Supplementary decrees of February 17 and March 12, 1880, amended the original concession to some extent. The concession, as modified, was transferred by the original holder to the Taltal Railway Co. (Ltd.) which was incorporated in London on June 3, 1881, for this purpose. Construction of the line was undertaken by Henry Meiggs, an American railway engineer, and under his auspices opened to traffic from Taltal, a major port with fairly good facilities for the handling of nitrate, to Refresco, a distance of 81 kilometers, in October, 1882. Under a concession granted October 17, 1887, the line was extended to Cachinal, which made through traffic possible from Taltal in June, 1889. In addition, concessions were authorized for the Santa Luisa branch on January 18, 1890; the Atacama branch on February 2, 1893; the Valliera and Miraflores branches on October 21, 1894; the Chile and

Alemanía branch on July 31, 1903; and the Morena branch on December 22, 1905. In addition, various other concessions have been authorized for the construction of smaller branches, so that at the end of the fiscal year ended June 30, 1928, the company had 280 kilometers of track in operation. The Lautaro Nitrate Railway Co.'s line, running from Santa Luisa to Atacama, is operated in connection with this railway so that a complete circuitous belt is formed from Canchas to the nitrate fields. The railway intercepts the Chilean Northern Railway Co. (Ltd.) at Catalina.

OPERATING OFFICIALS AND PURCHASES

The operating officials of the railway for the fiscal year ended June 30, 1928, were as follows:

Chairman.—F. Henderson, Langholm, Parkside, Wimbledon, London, S. W. 19.

Deputy chairman.—H. M. Greenwood, 241 South Norwood Hill, London, S. E. 25.

Secretary.—D. R. Finnis, River Plate House, 10-11 Finsbury Circus, London, E. C. 2.

Directors.—N. B. Dickson, O. B. E., "Straan," Wimbledon Park, London, S. W. 19; W. W. Parish, 9, Courtfield Road, London, S. W. 7; and C. H. Pearson, The Warren, Stevenage, Herts.

General manager.—J. S. Burns, Taltal, Chile.

Locomotive superintendent.—W. H. Revill, Taltal, Chile.

Resident engineer.—C. Trampe, Taltal, Chile.

Traffic manager.—J. H. Stevenson, Taltal, Chile.

Purchases are indicated by John S. Burns, the general manager of the railway at Taltal, although they are made through the home office of the company located at River Plate House, 10-11 Finsbury Circus, London, E. C. 2.

FINANCES

The company is capitalized at £1,200,000, issued in shares of a par value of £5 each. The following statements indicate the revenue account, net revenue account, and balance sheet for the railway for the fiscal years ended June 30, 1913, 1926, 1927, and 1928:

BALANCE SHEET FOR THE YEAR ENDED JUNE 30, 1913

LIABILITIES						
	£	s.	d.			
Balance of capital account, per statement No. 3.....	62,818	2	11			
Interest on first charge debentures, accrued to June 30, 1913..	4,989	13	2			
Unclaimed dividends.....	238	0	10			
Sundry creditors and credit balances:						
Chile, including advances from nitrate companies for construction of branch lines.....	£	s.	d.			
London.....	18,660	3	0			
Exchange adjustment account.....	3,360	5	1			
	22,850	4	6			
Bills payable.....	9,084	5	11			
Reserve for improvement of water supply.....	3,000	0	0			
Reserve for renewals, casualties, etc.....	74,547	13	7			
General reserve account.....	50,000	0	0			
Net revenue account, balance per statement No. 5.....	76,557	8	11			
	304,085	9	10			

ASSETS

	£	s.	d.	£	s.	d.
Sundry debtors and debit balances:						
Chile.....	21,986	0	2			
London.....	1,450	16	5			
				23,436	16	7
Stores on hand and in transit.....				65,337	5	11
Furniture and fixtures.....				1,785	10	2
Bills receivable.....				72,615	0	4
Investments at cost.....	61,200	18	9			
Less reserve for depreciation.....	2,000	0	0			
				59,200	18	9
Cash:						
Chile.....	3,733	15	1			
London, at bankers and on deposit at short call.....	77,976	3	0			
				81,709	18	1
				304,085	9	10

NOTE.—The currency assets and liabilities in Chile are taken at the rate of exchange, on June 30, 1913, of £99s. 16d. per dollar.

BALANCE SHEET FOR THE YEAR ENDED JUNE 30, 1926

LIABILITIES

	£	s.	d.	£	s.	d.
Balance of capital account, per statement No. 3.....	24,251	16	1			
Unclaimed dividends.....	350	11	3			
Sundry creditors and credit balances:						
Chile.....	8,254	14	0			
Exchange adjustment account.....	972	9	5			
London.....	30,859	13	10			
				40,086	17	3
Bills payable.....				7,505	0	6
General renewal, etc., reserve accounts.....				300,679	11	6
Pensions account (London).....				5,200	0	0
Net revenue account, balance per statement No. 5.....				83,037	13	7
				461,111	10	2

ASSETS

	£	s.	d.	£	s.	d.
Sundry debtors and debit balances:						
Chile.....	13,257	17	2			
London.....	1,499	18	4			
				14,757	15	6
Stores on hand and in transit.....				65,015	13	7
Furniture and fixtures.....				2,600	0	0
Bills receivable.....				32,179	18	9
Investments at cost.....	332,986	8	0			
Less reserve for depreciation.....	28,174	11	5			
				304,811	16	7
By cash in hand, at bankers and in treasury:						
Bills—						
Chile.....	4,878	5	5			
London.....	36,868	0	4			
				41,746	5	9
				461,111	10	2

NOTE.—The currency assets and liabilities in Chile are taken at the rate of exchange, on June 30, 1926, of \$40 to the pound sterling.

BALANCE SHEET FOR THE YEAR ENDED JUNE 30, 1927

LIABILITIES				£	s.	d.
Balance of capital account, per statement No. 3	-----			24,013	19	9
Unclaimed dividends	-----			311	12	3
Sundry creditors and credit balances:						
		£	s.	d.		
Chile	-----	8,458	6	6		
Exchange adjustment account	-----	1,044	11	2		
London	-----	12,588	16	5		
				22,091	14	1
Bills payable	-----			3,363	16	0
General, renewal, etc., reserve accounts	-----			300,464	0	8
Pensions account (London)	-----			5,408	0	0
Net revenue account, balance per statement No. 5	-----			74,371	15	4
				430,024	18	1
ASSETS				£	s.	d.
Sundry debtors and debit balances:						
		£	s.	d.		
Chile	-----	13,271	1	4		
London	-----	1,695	6	10		
				14,966	8	2
Stores on hand and in transit	-----			61,782	12	6
Furniture and fixtures	-----			2,600	0	0
Bills receivable	-----			19,400	16	9
Investments at cost	-----	353,457	11	6		
Less reserve for depreciation	-----	28,174	11	5		
				325,283	0	1
Cash in hand and at bankers:						
		£	s.	d.		
Chile	-----	3,675	13	7		
London	-----	2,316	7	0		
				5,992	0	7
				430,024	18	1

NOTE.—The currency assets and liabilities in Chile are taken at the rate of exchange, on June 30, 1927, of \$39.85 to the pound sterling.

BALANCE SHEET FOR THE YEAR ENDED JUNE 30, 1928

LIABILITIES				£	s.	d.
Balance of capital account, per statement No. 3	-----			23,006	2	9
Unclaimed dividends	-----			401	8	3
Sundry creditors and credit balances:						
		£	s.	d.		
Chile	-----	7,941	3	3		
Exchange adjustment account	-----	1,162	16	8		
London	-----	5,617	10	5		
				14,721	10	4
Bills payable	-----			4,588	19	5
General, renewal, etc., reserve accounts	-----			301,526	1	11
Pensions account (London)	-----			10,624	6	5
Net revenue account, balance per statement No. 5	-----			73,789	11	5
				428,658	0	6

NOTE.—The currency assets and liabilities in Chile are taken at the rate of exchange, on June 30, 1928, of \$39.60 to the pound sterling.

ASSETS				£	s.	d.
Sundry debtors and debit balances:						
		£	s.	d.		
Chile	-----	11,546	1	1		
London	-----	1,438	4	0		
				12,984	5	1
Stores on hand and in transit	-----			61,082	18	11
Furniture and fixtures	-----			2,600	0	0
Bills receivable	-----			29,122	9	2

	£	s.	d.	£	s.	d.
Investments at cost.....	322,918	15	11			
Less reserve for depreciation.....	21,892	9	6			
				301,026	6	5
Cash in hand and at bankers:						
Chile.....	5,866	11	9			
London.....	15,975	9	2			
				21,842	0	11
				428,658	0	6

REVENUE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1913

Debit	1911-12			1912-13		
	Amount		Per cent on gross receipts	Amount		Per cent on gross receipts
	£	s. d.		£	s. d.	
Permanent way and works, abstract A.....	21,120	15 7	7.32	18,582	13 8	6.08
Locomotive expense, abstract B.....	67,400	0 7	23.35	74,217	19 6	24.29
Carriage and wagon expenses, abstract C.....	9,134	9 0	3.16	9,953	14 5	3.26
Traffic expenses, abstract D.....	26,595	5 3	9.21	27,705	19 8	9.06
Water-sale expenses, abstract E.....	761	0 4	.26	708	0 8	.23
Pier expenses, abstract F.....	3,398	1 3	1.18	3,121	8 5	1.02
General charges, abstract G.....	15,370	17 4	5.33	15,721	11 3	5.15
Total.....	143,780	9 4	49.81	150,011	7 7	49.09
Balance to net revenue account.....	144,910	10 6	50.19	155,554	5 8	50.91
	288,690	19 10	100.00	305,565	13 3	100.00

Credit	1911-12		1912-13		Credit	1911-12		1912-13	
	£	s. d.	£	s. d.		£	s. d.	£	s. d.
Passengers.....	12,073	12 9	12,968	14 11	Luggage and parcels.....	4,401	6 9	4,814	15 7
Goods.....	263,792	5 0	278,831	11 5	Water sales.....	4,156	9 1	4,184	5 3
Animals.....	638	4 5	824	1 0	Sundry.....	2,060	8 2	2,570	14 7
Telegraph.....	197	13 6	171	9 10					
Pier dues.....	1,371	0 2	1,200	0 8					
						288,690	19 10	305,565	13 3

REVENUE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1926

Debit	1924-25			1925-26		
	Amount		Per cent on receipts	Amount		Per cent on receipts
	£	s. d.		£	s. d.	
Permanent way and works, abstract A.....	26,609	8 0	8.23	21,729	19 2	8.74
Locomotive expenses, abstract B.....	55,552	11 3	17.18	45,152	8 9	18.17
Carriage and wagon expenses, abstract C.....	11,934	0 3	3.69	10,449	8 0	4.20
Traffic expenses, abstract D.....	25,015	17 8	7.74	24,216	16 8	9.75
Water-sale expenses, abstract E.....	927	18 5	.29	855	4 5	.34
Pier expenses, abstract F.....	4,274	9 0	1.32	3,367	9 0	1.36
General charges, abstract G.....	24,499	0 9	7.57	22,769	18 6	9.16
Chilean taxation, abstract H.....	7,706	18 4	2.38	13,783	19 1	5.55
Total.....	156,520	3 8	48.40	142,325	3 7	57.27
Balance carried down.....	166,844	2 9	51.60	106,183	17 1	42.73
	323,364	6 5	100.00	248,509	0 8	100.00

Credit	1924-25		1925-26		Credit	1924-25		1925-26	
	£	s. d.	£	s. d.		£	s. d.	£	s. d.
Passengers.....	11,562	11 10	7,934	16 5	Luggage and parcels.....	5,592	5 2	4,886	14 6
Goods.....	297,447	5 10	228,666	13 11	Water sales.....	2,359	3 3	2,179	11 2
Animals.....	562	1 3	620	11 0	Sundry.....	4,599	12 7	3,687	5 0
Telegraph.....	230	12 9	178	13 4					
Pier dues.....	1,010	13 9	354	15 4					
						323,364	6 5	248,509	0 8

REVENUE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1927

Debit	1925-26			1926-27		
	Amount		Per cent on receipts	Amount		Per cent on receipts
	£	s. d.		£	s. d.	
Permanent way and works, abstract A.....	21,729	19 2	8.74	8,565	8 7	7.00
Locomotive expenses, abstract B.....	45,152	8 9	18.17	23,031	17 3	18.81
Carriage and wagon expenses, abstract C.....	10,449	8 0	4.20	3,508	7 7	2.87
Traffic expenses, abstract D.....	24,216	16 8	9.75	16,730	10 5	13.67
Water sale expenses, abstract E.....	855	4 5	.34	412	19 0	.34
Pier expenses, abstract F.....	3,367	9 0	1.36	3,260	4 11	2.66
General charges, abstract G.....	22,769	18 6	9.16	21,477	19 6	17.54
Chilean taxation, abstract H.....	13,783	19 1	5.55	11,748	1 9	9.60
Total.....	142,325	3 7	57.27	88,735	9 0	72.49
Balance carried down.....	106,183	17 1	42.73	33,680	9 2	27.51
	248,509	0 8	100.00	122,415	18 2	100.00

Credit	1925-26			1926-27			1925-26			1926-27			
	£	s.	d.	£	d.	d.	£	s.	d.	£	s.	d.	
Passengers.....	7,934	16	5	4,019	4	3	Luggage and parcels.....	4,886	14	6	3,627	1	3
Goods.....	228,666	13	11	111,391	8	11	Water sales.....	2,179	11	2	1,504	6	3
Animals.....	620	11	0	208	9	3	Sundry.....	3,687	5	0	1,552	15	4
Telegraph.....	178	13	4	67	7	4							
Pier dues.....	354	15	4	45	5	7							
								248,509	0	8	122,415	18	2

REVENUE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1928

Debit	1926-27			1927-28		
	Amount		Per cent on receipts	Amount		Per cent on receipts
	£	s. d.		£	s. d.	
Permanent way and works, abstract A.....	8,565	8 7	7.00	10,045	9 8	6.07
Locomotive expenses, abstract B.....	23,031	17 3	18.81	27,417	6 4	16.56
Carriage and wagon expenses, abstract C.....	3,508	7 7	2.87	4,976	5 3	3.01
Traffic expenses, abstract D.....	16,730	10 5	13.67	18,810	16 5	11.37
Water sale expenses, abstract E.....	412	19 0	.34	349	12 4	.21
Pier expenses, abstract F.....	3,260	4 11	2.66	2,928	14 5	1.77
General charges, abstract G.....	21,477	19 6	17.54	21,988	2 2	13.28
Chilean taxation, abstract H.....	11,748	1 9	9.60	7,660	7 0	4.63
Total.....	88,735	9 0	72.49	94,176	13 7	56.90
Balance carried down.....	33,680	9 2	27.51	71,341	14 8	43.10
	122,415	18 2	100.00	165,518	8 3	100.00

Credit	1926-27			1927-28			Credit	1926-27			1927-28		
	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
Passengers.....	4,019	4	3	3,246	11	4	Luggage and parcels.....	3,627	1	3	2,049	14	5
Goods.....	111,391	8	11	156,164	5	7	Water sales.....	1,504	6	3	1,705	15	8
Animals.....	208	9	3	214	19	1	Sundry.....	1,552	15	4	1,924	15	1
Telegraph.....	67	7	4	48	8	3							
Pier dues.....	45	5	7	163	18	10							
								122,415	18	2	165,518	8	3

NET REVENUE ACCOUNT FOR YEAR ENDED JUNE 30, 1913

DEBIT					
	£	s. d.	£	s.	d.
Debenture service:					
Interest	10,894	10 0			
Sinking fund	13,105	10 0			
			24,000	0	0
Income tax			2,316	14	2
Stamp duty, etc., on issue of bonus shares			647	6	0
General reserve account			50,000	0	0
Reserve for depreciation of investments			2,000	0	0
Interim dividend of 3s. per share to Dec. 31, 1912			27,000	0	0
Balance carried down			76,557	8	11
			182,521	9	1
CREDIT					
	£	s. d.	£	s.	d.
Balance of revenue account	155,554	5 8			
Registration fees	121	17 6			
Interest and discount	4,160	1 10			
	£	s. d.			
Balance from previous year	67,685	4 1			
Less final dividend of 4s. and bonus of 2s. per share to June 30, 1912	45,000	0 0			
			22,685	4	1
			182,521	9	1

NET REVENUE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1926

DEBIT					
	£	s. d.	£	s.	d.
Income tax suspense account	18,947	13 1			
Interim dividend of 3s. per share to Dec. 31, 1925, (free of income tax)	36,000	0 0			
Balance carried down	83,037	13 7			
			137,985	6	8
CREDIT					
	£	s. d.	£	s.	d.
Balance of revenue account	106,183	17 1			
Registration fees	49	17 6			
Interest and discount	12,787	0 3			
	£	s. d.			
Balance from previous year	78,964	11 10			
Less final dividend to June 30, 1925	60,000	0 0			
			18,964	11	10
			137,985	6	8

NET REVENUE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1927

DEBIT					
	£	s. d.	£	s.	d.
Income tax suspense account	9,928	8 10			
Interim dividend of 1s. per share to Dec. 31, 1926 (free of income tax)	12,000	0 0			
Balance carried down	74,371	15 4			
			96,300	4	2
CREDIT					
	£	s. d.	£	s.	d.
Balance of revenue account	33,680	9 2			
Registration fees	47	0 0			
Interest, discount, etc.	15,535	1 5			

	£	s.	d.	£	s.	d.
Balance from previous year.....	83,037	13	7			
Less final dividend to June 30, 1926.....	36,000	0	0			
				47,037	13	7
				96,300	4	2

NET REVENUE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1928

DEBIT						
	£	s.	d.			
Income tax suspense account.....	13,300	0	0			
Interim dividend of 2s. per share to Dec. 31, 1927 (free of income tax).....	24,000	0	0			
Balance carried down.....	73,789	11	5			
				111,089	11	5
CREDIT						
	£	s.	d.			
Balance of revenue account.....	71,341	14	8			
Registration fees.....	58	0	0			
Interest, discount, etc.....	13,318	1	5			
	£	s.	d.			
Balance from previous year.....	74,371	15	4			
Less final dividend June 30, 1927.....	48,000	0	0			
				26,371	15	4
				111,089	11	5

FREIGHT AND PASSENGER TRAFFIC

Nitrate, of course, is the principal commodity carried by the railway. The following table indicates the inward and outward freight traffic movement for fiscal years ended June 30, 1912 to 1928, inclusive:

Year	Up goods traffic			Down goods traffic		
	Quantity		Receipts	Quantity		Receipts
	Tons	£		Tons	£	
1911-12.....	142,527	138,290	2 2	311,302	129,903	9 7
1912-13.....	158,240	151,665	6 0	315,677	131,981	1 0
1919-20.....	86,973	99,752	11 5	238,130	104,727	7 8
1920-21.....	108,001	121,419	18 0	255,491	108,922	3 4
1924-25.....	103,330	149,242	9 8	279,385	153,797	1 4
1925-26.....	77,958	111,894	3 4	218,104	121,659	5 0
1926-27.....	25,958	39,640	3 2	123,523	75,378	7 0
1927-28.....	45,526	58,664	13 10	196,394	99,284	8 8

The following table indicates the passenger traffic and receipts for the fiscal years ended June 30, 1912 to 1928, inclusive:

Year	Passen- gers carried	Receipts		Year	Passen- gers carried	Receipts		Year	Passen- gers carried	Receipts	
		£	s. d.			£	s. d.			£	s. d.
1912-13....	88,230	12,968	14 11	1918-19....	35,577	5,977	4 9	1924-25....	58,749	11,562	11 10
1913-14....	83,954	11,652	0 3	1919-20....	70,839	10,049	13 7	1925-26....	35,076	7,934	16 5
1914-15....	45,974	6,713	9 7	1920-21....	81,385	11,143	3 7	1926-27....	14,724	4,019	4 3
1915-16....	55,992	8,338	12 8	1921-22....	44,147	6,042	1 2	1927-28....	12,339	3,246	11 4
1916-17....	58,653	8,864	18 0	1922-23....	37,570	6,273	9 1				
1917-18....	53,469	7,380	7 8	1923-24....	55,706	9,477	18 9				

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The highest point on the system is 2,809 meters above sea level, about 136.7 kilometers from Taltal on the main line.

Gage.—The gage of the railway is 1.067 meters.

Curves.—The radius of the minimum curve on the railway is 70 meters.

Grades.—The maximum up grade is 4.6 per 100 for 40 meters, while the maximum down grade is 3.25 per 100 for 260 meters.

Rails.—Steel rails, weighing 20.34 and 27.78 kilograms to the meter, in 7.62 meter sections, are used. Rail anchors have been installed.

Ties.—Ties of roble pellin, secured locally. 1.83 by 0.20 by 0.13 meters, spaced 1,500 to the kilometer, are used.

Water stations.—The railway company supplies water for the town of Taltal, the ships in the bay, as well as their own needs, and sometimes experiences considerable difficulty in meeting demands. Recently additions have been made to pipe lines and a new main laid from Agua Verde to Chanchas. There are eight water stations, with a total capacity of 55 hectoliters and spaced an average distance apart of 35.8 kilometers.

Fuel stations.—Both coal and oil are used for fuel. There is one coal station with a capacity of 240 tons and three oil stations with a total capacity of 45 tons. Fuel stations are located at an average distance apart of 23.25 kilometers.

Maintenance.—The general condition of the railway is good.

Tunnels.—There are no tunnels on the railway.

Culverts and small bridges.—There are four small bridges and culverts on the line, extending a total distance of 22 meters.

Employees.—The railway employs 477 persons.

MOTIVE POWER AND ROLLING STOCK

As of June 30, 1928, the railway owned the following motive power and rolling stock:

Locomotives:		Freight cars—Continued.	
Small 6-wheel coupled.....	7	Bogie, wood, iron floor, flat..	40
Large 6-wheel coupled.....	23	Bogie, covered.....	3
Meyer double engines.....	10	4-wheel, iron.....	47
		4-wheel, wood.....	22
Total.....	40	4-wheel, covered.....	2
		4-wheel, timber.....	5
Passenger coaches:		Tank wagons.....	11
English composite.....	3	Luggage vans and sundry..	18
• American saloon.....	9	Oil-tank wagons.....	75
Administration.....	2	Nitrate trolley cars.....	68
Engineers'.....	1		
Paymaster's.....	1	Total.....	1, 128
4-wheel.....	2		
Total.....	18	Motor Cars:	
		Rail motor car.....	1
		Ambulance car.....	1
Freight cars:		Total.....	2
Bogie, iron.....	814		
Bogie, wood.....	23		

PRINCIPAL MINING RAILWAYS OF CHILE

FERROCARRIL MINERAL DE CHUQUICAMATA

(Chile Exploration Co. Railway)

The first section of the Chuquicamata mine railway, which is operated by the Chile Exploration Co. in connection with its mining properties, was opened to traffic in 1914 and since that time has been gradually extended, as the mining operations of the company warranted, until the mine railway system proper at the end of 1928 comprised 67.4 kilometers of 1.435-meter gage track. In addition to the mine railway there is also a plant railway system operated in connection with this enterprise. This system was first placed in operation in 1913 and connects with the Antofagasta & Bolivia Railway over which freight is carried to the port of Antofagasta. In all, the plant railway comprises about 59 kilometers of 1.435-meter gage track. All incoming and outgoing material for Chuquicamata is handled through the port of Antofagasta. The Antofagasta & Bolivia Railway branch terminal is 11.5 kilometers from the center of the plant and by equipping the plant railway system with a third rail, Antofagasta & Bolivia Railway rolling stock, which is of 1-meter gage, can be operated over most of the plant lines. All haulage, however, is done by broad-gage locomotives belonging to the Chile Exploration Co. In addition to these two railway lines, the company also operates a 0.75-meter gage industrial line connecting the electrolytic tank house and furnace refinery, a distance of about 500 meters, together with the necessary sidings. This line is used entirely for the transport of copper and its equipment consists of 12 six-ton battery locomotives, 500 three-ton cathode trucks, and 50 side dump tolva cars.

OPERATING OFFICIALS AND PURCHASES

The general manager of the railway is Burr Wheeler, who should be addressed in care of the railway at Chuquicamata. Purchases indicated by Mr. Wheeler, are generally made through the office of the Chile Exploration Co., 25 Broadway, New York City.

There is no data available pertaining to the finances of this railway.

TRAFFIC

According to Chilean Government statistics, the railway carried 7,390,764 tons of freight in 1923, 7,554,765 tons in 1924, 7,778,910 tons in 1925, and 7,532,384 tons in 1926. The general manager of the railway reports that during the calendar year 1928, a total of 9,463,663 short tons of ore and 5,699,643 tons of waste were removed from the mines, all of which was handled by the mine railway. The plant railway system handled a total of 8,981,209 short tons of tailings during the same year. In addition, there was also received 86,785 short tons of miscellaneous cargo from the Antofagasta & Bolivia Railway and 131,879 short tons of copper delivered to them during this same period. The railway handles no passenger traffic excluding the daily labor trains which carry approximately 4,000 workmen a day.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The railway is of 1.435-meter gage.

Grades.—The ruling grade is 2.6 per cent although a few are 3 per cent and one is of $5\frac{1}{2}$ per cent.

Curves.—The minimum curve radius is 181 meters.

Rails.—Steel rails, weighing 37 and 45 kilograms per meter in 10 and 12 meter sections, are used. The heavier rails are used on the main line. The types used are Pennsylvania railroad standard 10031 section, A.S.C.E. standard 8040 section.

Ties.—Ties of roble pellin, secured locally, 3.5 by 0.23 by 0.18 meter and spaced on 0.55-meter centers are used.

Fuel.—Electricity (600-volt direct current third rail and storage battery), coal, and petroleum are used for fuel. In the middle of 1929 approximately one-half of the mine railway system bench approaches had been electrified and it is intended to eventually electrify the entire mine system.

Ballast.—Rock is used for ballast.

Maintenance.—The roadbed is kept in excellent condition.

Employees.—The railway during the calendar year 1926 employed 964 men. It is presumed that some of these employees were used in connection with work at the mines, although this is not indicated in the official report.

Signaling equipment.—Locally made air operated semaphores are used for signaling.

Bridges.—There are 40 bridges having a total length of 290 meters. Thirty-nine of these bridges are of wood construction and the other of steel.

Tunnels.—There are no tunnels on the line.

MOTIVE POWER AND ROLLING STOCK

At the end of the calendar year 1928 the company had the following locomotives and rolling stock in operation.

LOCOMOTIVES

	Number
75-ton, combination third rail and storage battery.....	10
70-ton, combination third rail and trolley.....	4
Steam locomotives of various makes and sizes ranging from 20 to 110 tons on the drivers.....	57

CARS

70-ton gondola type ore cars.....	380
20-yard air-dump waste cars.....	80
20-yard hand-dump waste cars.....	43
12-yard hand-dump tailing and waste cars.....	120
Flat cars, various capacities.....	50
Flat cars, equipped with iron sides for transport of workmen.....	28
Box cars for transport of explosives.....	2

Couplers.—A. R. A. standard automatic couplers, 0.876 meters from the top of rail, are used.

Draft rigging.—A. R. A. standard draft rigging and couplings are used. There are no buffers or heating system.

REPAIR SHOPS

There are two repair shops, one of which is located at the mine and the other at the plant. The shops employ approximately 200 men who competely overhaul 50 cars and make light running repairs to 4,200 cars during a year. The shops are well equipped in as much as they are part of the main mine and plant shops and are complete with power-driven tools.

FERROCARRIL PUEBLO HUNDIDO A POTRERILLOS

(Andes Copper Mining Co. Railway)

The Andes Copper Mining Co. operates a line connecting the copper mines at Potrerillos with the main line at the port of Chañaral. The total length of this railway of 105.26 kilometers, of which 97.02 kilometers represents the main line.

OPERATING OFFICIALS AND PURCHASES

All purchases are indicated by the general manager of the railway, W. B. Lauenders, who should be addressed in care of the railway, Teatinos 351, Santiago, Chile. Purchases, as a rule are made through the purchasing agent of the Andes Copper Mining Co. at 25 Broadway, New York City.

FINANCES

The railway had a capitalization of 30,669,419 pesos at the end of the calendar year 1927. The operating revenues and operating expenses of the railway during the calendar years 1925, 1926, and 1927 were as shown in the following table:

Year	Receipts	Expenses	Profit
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1925	1,839,415	1,694,749	144,666
1926	6,662,208	6,224,561	437,707
1927	7,149,315	6,233,894	915,420

NOTE.—Data from Anuario Estadístico de la República Chile.

PASSENGER AND FREIGHT TRAFFIC

The following table indicates the number of passengers and amount of freight carried by the railway during the calendar years 1922, 1925, 1926, and 1927.

Year	Passengers carried	Freight carried	Year	Passengers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1922		2,188	1926	81,675	150,959
1925	30,312	48,489	1927	55,166	150,326

NOTE.—Data from Anuario Estadístico de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The railway is of 1-meter gage.

Grades.—The maximum up grade is one of 3.5 per 100 for 20 meters, while the maximum down grade is 3.5 per 100 for a distance of 10.5 meters.

Curves.—The minimum curve radius on the line is 86 meters.

Rails.—Steel rails, weighing 34.8 kilograms per meter, in 10-meter sections, are used.

Ties.—Ties of roble pellin, secured locally, 2 by 0.20 by 0.15 meters, and spaced 1,650 to the kilometer, are used.

Water.—There are eight water stations along the line, having a total capacity of 5,600 hectoliters. These stations are spaced an average distance of 9.3 kilometers apart.

Fuel.—Oil is used as fuel. There are three fuel stations having a total capacity of 332 tons and spaced an average distance of 32 kilometers apart.

Employees.—The railway employed 334 men during the calendar year 1927.

Maintenance.—The railway is kept in good condition.

Culverts and small bridges.—There are nine culverts and small bridges along the railway, having a total length of 78 meters.

Tunnels and galleries.—There are 11 tunnels, having a total length of 1,662 meters.

MOTIVE POWER AND ROLLING STOCK

The motive power and rolling stock operated by the railway at the end of the calendar year 1927 was as follows:

Locomotives.....	10	Freight cars:	
Passenger cars:		Flat cars.....	37
Second class.....	3	Box cars.....	5
Autorail cars.....	7	Cattle cars.....	1
Miscellaneous.....	2	Gondola cars.....	20
		Special cars.....	29
Total.....	12	Total.....	92
		Total rolling stock.....	104

FERROCARRIL ELECTRICO DE CRUZ GRANDE AL TOFO

(Caleta Cruz Grande al Tofo; Bethlehem-Chile Iron Mines Co. Railway)

This railway was constructed to connect the port of Cruz Grande, in the Province of Coquimbo, with the iron mines owned by the Bethlehem-Chile Iron Mines Co., located at Tofo, a distance of 24.5 kilometers. The line is privately owned and operated and at the end of 1927 had 29.5 kilometers of track in operation which included about 5 kilometers of branches.

OPERATING OFFICIALS AND PURCHASES

Edward Quackenbush is the managing director of the company and is located at Tofo. All purchases for the railway are made direct through the offices of the company which are located at La Higuera, Province of Coquimbo. The main offices of the company are located in Bethlehem, Pa.

FINANCES

Inasmuch as the railway is operated in connection with the mines, no independent financial information is available. At the end of the calendar year 1927 the capital invested in the railway was 12,790,888 pesos made up as follows: 10,299,888 pesos, value of construction; 2,420 pesos, value of rolling stock; and 71,000 pesos, value of material and other parts. The expenses of operating the railway during the calendar year 1927 amounted to 785,923.50 pesos as compared with 698,447.32 pesos during 1926. The following table indicates the nature of these expenses during the calendar years 1926 and 1927:

Expenses	1926	1927
	<i>Pesos</i>	<i>Pesos</i>
Upkeep of equipment.....	152,043.06	147,694.27
Transportation.....	402,754.29	421,225.52
Road, constructions, etc.....	143,649.97	217,003.71
Total.....	698,447.32	785,923.50

FREIGHT TRAFFIC

The traffic handled by the railway is principally iron ore and merchandise and material required for service. The following table indicates the kind and amount of freight carried, for the calendar years 1925, 1926, and 1927:

	1925	1926	1927
Merchandise and material required for service.....tons.....		3, 167	3, 879
Iron ore carried.....do.....		1, 478, 404	1, 520, 033
Total traffic.....	1, 211, 150	1, 481, 571	1, 523, 912
MISCELLANEOUS DATA			
Distance covered by freight cars with minerals.....kilometers.....		35, 750	40, 512
Distance covered by locomotives.....do.....		75, 400	90, 734
Number of trains in operation during year.....		2, 940	3, 376
Total deadweight of trains operating during the year.....tons.....		1, 563, 800	1, 477, 000

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The railway runs from 36.57 meters above sea level to 669.54 meters, which is the highest point.

Gage.—It is of 1.435-meter gage.

Grade.—The maximum grade is 3 per cent, extending a distance of 6,898 meters. There is one other grade of 1 per cent, extending about 1,609.34 meters.

Curves.—The minimum curve radius on the system is 108 meters.

Ballast.—Crushed rock secured locally is used as ballast.

Employees.—The company employed 47 men during 1927.

Ties.—Roble pellin ties secured locally, as well as pine ties imported from the United States, are used. These ties are 0.12 by 0.23 by 2.58 meters, and are spaced 21 inches on centers on the 3 per cent grade and 23 inches on centers on the 1 per cent grade.

Rails.—Rails of standard A. R. A. type A, weighing 49.6 kilos per meter, in 10-meter sections, are used.

Fuel.—The road is electrically operated. There is one electric substation

Signaling.—A telephone system of signaling is used.

Maintenance.—The road is in good condition.

Bridges.—There are 13 culverts and small bridges having a total length of 19 meters.

MOTIVE POWER AND ROLLING STOCK

At the end of the calendar year 1927, the company had in operation three electric locomotives weighing 120 tons each with the 0-4-4-0 wheel arrangement.

The rolling stock consisted of 1 auto rail car; 50 freight cars, for the transportation of minerals, with a capacity of 50 tons each; 5 flat cars with a capacity of 40 tons each; and 2 tank cars, each of 10 tons capacity.

Couplers.—Automatic couplers, at a height of 1.86 meters above the rail, are used.

THE BRADEN COPPER CO. RAILWAY

(Ferrocarri del Braden Copper Co.; Ferrocarril Rancagua al Teniente)

Construction work on this railway began at Rancagua in 1907, and the line was completed to Sewell in 1910, and since extended to Teniente, a distance of 75 kilometers of single track. In addition it has about 16.9 kilometers of branches, aggregating 91.9 kilometers, the present length. It was some few years later, however, before the line was actually in working condition owing to the necessity of

ballasting and resurfacing. The line is operated in connection with the mining property of the Braden Copper Co. located at Sewell.

OPERATING OFFICIALS AND PURCHASES

The road is privately owned and operated by the Braden Copper Co. with its main office located at 120 Broadway, New York City. The principal operating officials of the company in Chile are as follows:

General manager.—L. E. Grant, Rancagua, Chile.

Assistant general manager.—W. J. Turner, Rancagua, Chile.

Superintendent.—J. Chambers, Rancagua, Chile.

Manager financial and supply agency.—Alfred Houston, Casilla 49-D, Santiago, Chile; also Casilla 17-A, Valparaiso, Chile.

Director of purchases.—Braden Copper Co., 120 Broadway, New York City, E. R. Reets.

Purchasing agent.—M. C. Piggott, Cory Buildings, Fenchurch Street, London, England.

Purchases are generally made direct by the last three mentioned officials, and, as a rule, are consummated in the United States.

FINANCES

The company is capitalized at 14,377,161 pesos. Operating revenues and expenses of the railway for the calendar years 1918 to 1927 are as shown in the following table:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	8,899,890	8,374,776	525,114	-----	1923.....	5,345,598	5,326,278	19,320	-----
1919.....	4,362,543	3,749,184	613,359	-----	1924.....	4,729,236	4,997,754	-----	268,518
1920.....	5,618,403	5,434,356	184,047	-----	1925.....	4,480,896	4,781,560	-----	300,664
1921.....	4,050,831	4,427,031	-----	376,200	1926.....	5,471,483	5,253,107	218,325	-----
1922.....	4,561,647	4,733,115	-----	171,468	1927.....	5,055,309	5,212,653	-----	157,343

NOTE.—Data from Anuario Estadístico de la República de Chile.

TRAFFIC

The freight and passenger traffic of the railway for the calendar years 1918 to 1927 was as shown in the following table:

Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried
	<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>
1918.....	236,094	119,968	1922.....	176,078	68,219	1925.....	215,456	79,040
1919.....	118,080	91,430	1923.....	224,102	69,388	1926.....	240,612	71,502
1920.....	190,619	89,029	1924.....	249,156	69,655	1927.....	239,340	76,266
1921.....	99,725	60,086						

NOTE.—Data from Anuario Estadístico de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The minimum altitude above sea level along the right of way is 499 meters at Rancagua, while the maximum altitude reached is 2,098 meters at Teniente.

Gage.—The gage of the road is 76 centimeters or about 2.5 feet.

Grades.—For 31 kilometers, between Rancagua and Coya, there is an average grade of 1 per cent with a maximum of $3\frac{1}{2}$ per cent. Between Coya and Sewell, a distance of 41 kilometers, the average grade is 3.2 per cent with a maximum of 4.4 per cent. There is no adverse grade on the line.

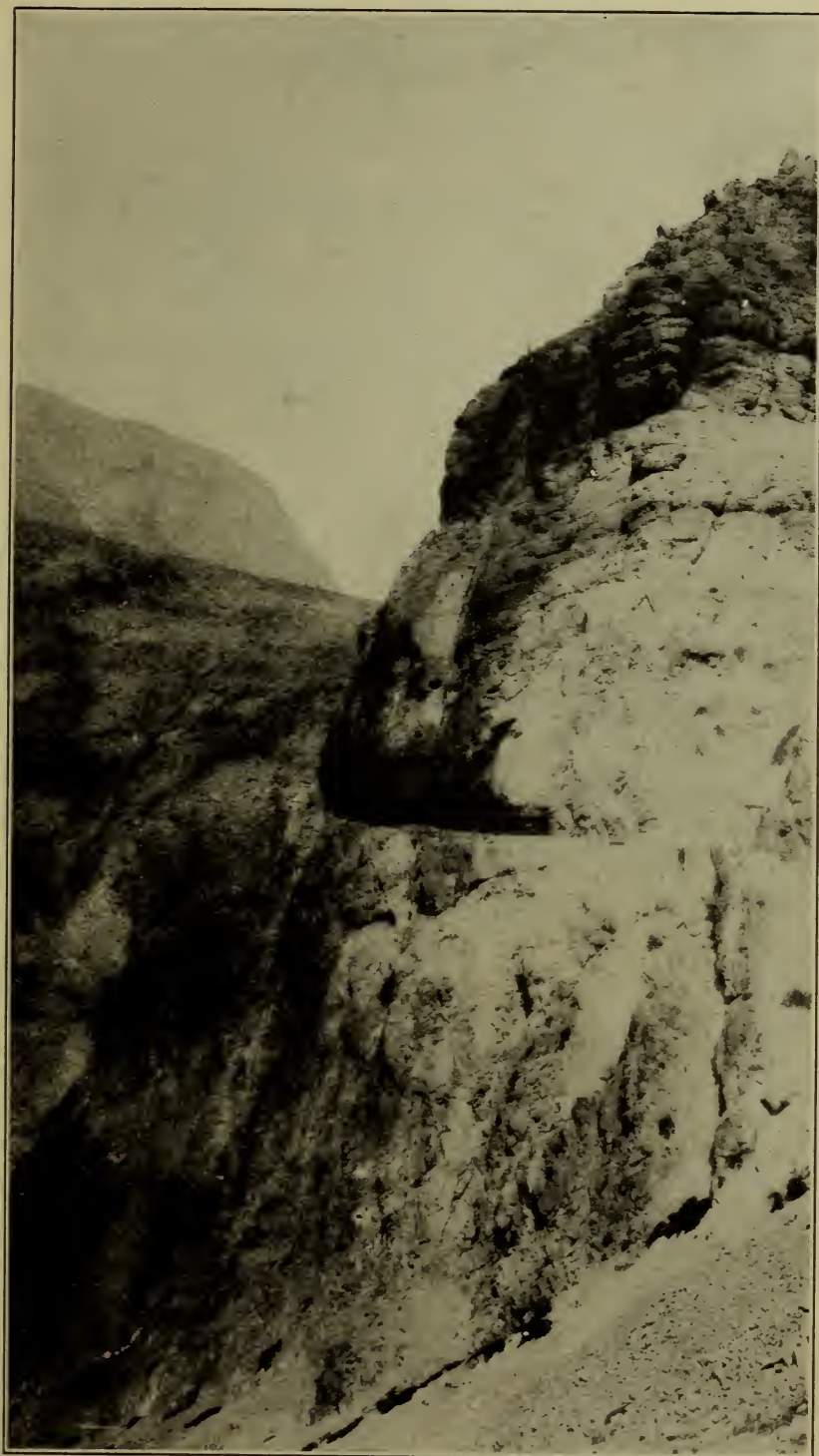


FIGURE 44.—Section of Rancagua to El Teniente Railroad

Curves.—The radius of the smallest curve on the road is 22.5 meters.

Ballast.—Rock, secured locally, is used as ballast.

Ties.—Ties are secured from southern Chile and made from a hard type of native oak known as roble. The ties used are 1.85 by 0.20 by 0.15 meters, spaced 2,000 to the kilometer.

Employees.—The company employs approximately 496 men.

Rails.—A. S. C. E. rails, weighing 8.2 and 27.3 kilograms per meter in sections of 9.15 and 10.06 meters, are used.

Water.—Water is obtained locally. Eight tanks are stationed at a maximum distance apart of 9.3 kilometers. These tanks are circular in shape, made of wood, and have a capacity of 22,000 hectolitres.

Fuel.—Crude oil, imported from the United States or Mexico, is used for fuel. Four oil stations with a total capacity of 450 tons are located a maximum distance apart of 18.7 kilometers. At the present time there are no plans for electrification of the line or change in fuel.

Signaling equipment.—Hall's automatic signals are used at road crossings, together with target switch stands of a comparatively good height.

Maintenance.—The road is kept in good condition and is able to handle all traffic required.

Culverts and small bridges.—There are 350 culverts and small bridges with a total length of 335 meters.

Bridges.—There is one bridge located on the line at kilometer 50.75. This bridge is of a deck girder type, of two spans, totaling 17.7 meters in length.

Tunnels.—There is one tunnel on the line located at kilometer 30.5. This tunnel is 51 meters in length and constructed through solid rock, using timber sets with heavy plank lagging as supports. In addition there are four other tunnels with a total length of 1,125 meters.

MOTIVE POWER AND ROLLING STOCK

The motive power and rolling stock in use by the railway at the end of the calendar year 1927 was as follows:

LOCOMOTIVES

Five, Donkey type, 20-ton; two cylinders, 11 inches in diameter, 16-inch stroke; wheel arrangement, 0-4-0.

Five, Shay type, 60-ton; three cylinders, 11 inches in diameter, 12-inch stroke; wheel arrangement, 4-4-4.

Nine, Shay type, 42-ton; three cylinders, 10 inches in diameter, 12-inch stroke; wheel arrangement, 0-4-4.

ROLLING STOCK

Type of cars:

Passenger.....	13
Flat cars.....	96
Coal and coke.....	40
Tank cars.....	10
Box cars.....	17
Concentrate, etc.....	14

Type of cars—Continued.

Scale control.....	1
Snow plows.....	2
Motor cars for passenger service.....	7
Total.....	200

Couplers.—Automatic M. C. B. couplers, 0.99 meters from top of rail, are used.

REPAIR SHOPS

Repair shops are located at Rancagua. These shops, when working to capacity, employ 150 men. An average of 10 locomotives are repaired during each year. Purchases for the shops are made in the same manner as other equipment.

FERROCARRIL CONCEPCION ARAUCO CURANILAHUE

(Arauco Co. (Ltd.); Compañía Minera é Industrial de Chile)

The history of this railway dates from a law of October 23, 1884, and a supplementary decree of July 4, 1886, which authorized the Arauco Co. (Ltd.) to construct a railway from Concepcion through

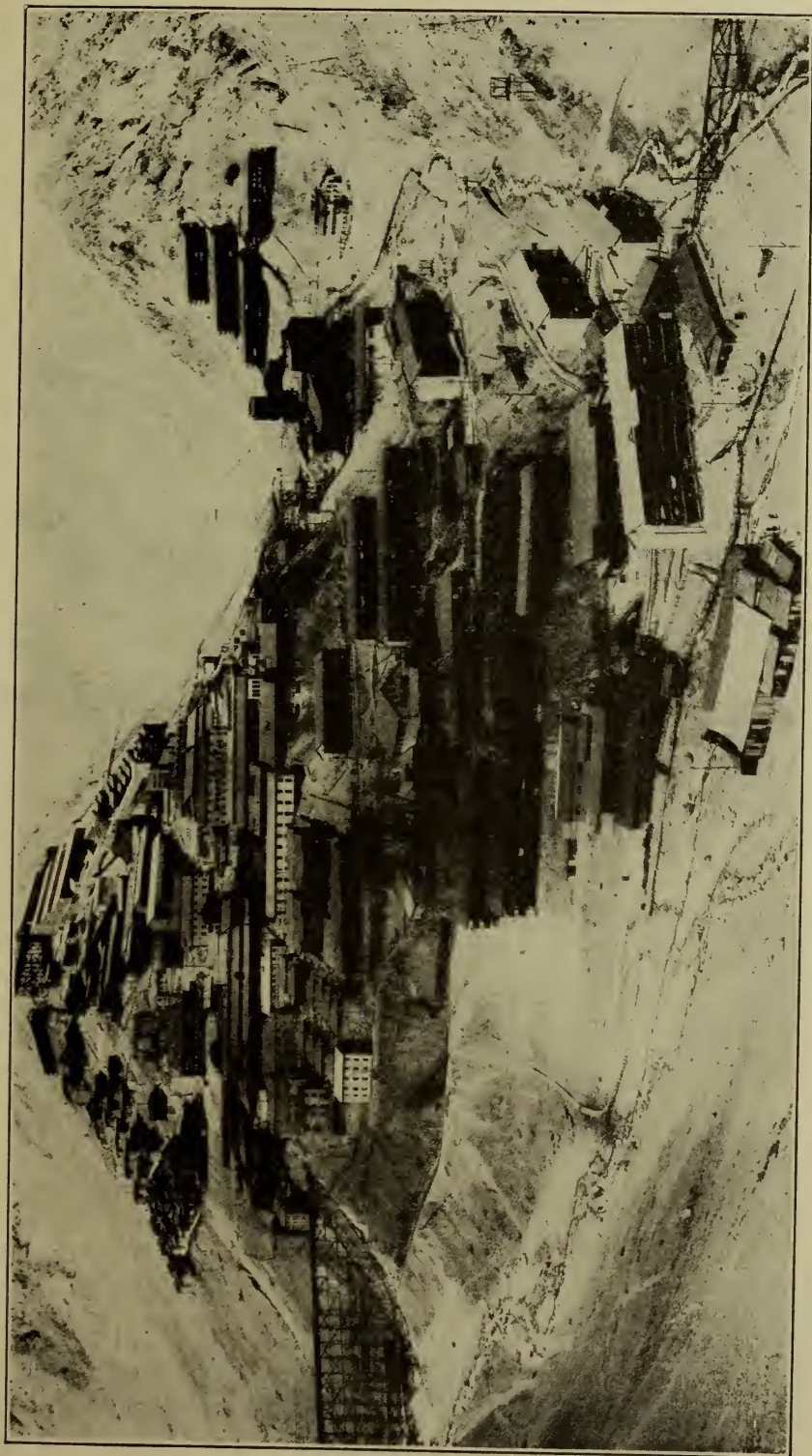


FIGURE 45.—Terminal of Rancagua to El Teniente Railroad

the ports of Coronel and Lota, as well as other important coal centers and terminating at Curanilahue, a total distance of 95 kilometers. In addition a branch was constructed to the port of Arauco, a distance of 8 kilometers. At the end of the calendar year, 1927, the company had 98.5 kilometers of main line and 27.9 kilometers of sidings aggregating 126.4 kilometers of track in operation.

Under the terms of the concession a 5 per cent guarantee was granted by the Government for the first 20 years on a maximum construction cost of 90,000 pesos. In addition the company operates the coal mines in connection with the railway.

PURCHASES

All purchases are made direct by the Compañía Minera é Industrial de Chile located at Calle Blanco 747, Casilla 145-V, Valparaíso, Chile. C. D. Rice Oxley is the manager, and should be addressed in care of the railway at Casilla 970, Concepcion, Chile.

FINANCES

The company was capitalized at 34,413,600 pesos in 1927. The operating revenues and expenses of the railway for the calendar years 1918 to 1927, inclusive, were as shown in the following table:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	6,684,180	4,496,328	2,187,852	-----	1923.....	6,170,145	3,396,702	2,773,443	-----
1919.....	5,563,446	5,200,167	363,279	-----	1924.....	8,197,449	3,362,631	4,834,818	-----
1920.....	6,572,088	4,425,714	2,146,374	-----	1925.....	6,513,189	3,726,667	2,786,522	-----
1921.....	7,609,818	5,254,641	2,355,177	-----	1926.....	5,615,085	3,822,167	1,792,918	-----
1922.....	6,316,809	6,467,679	-----	150,870	1927.....	6,599,370	3,825,104	2,774,266	-----

NOTE.—Data from Anuario Estadístico de la República de Chile.

TRAFFIC

The freight and passenger traffic of the railway for the calendar years 1918 to 1927 were as shown in the following table:

Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried	Year	Freight carried	Passengers carried
	<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>		<i>Tons</i>	<i>Number</i>
1918.....	498,481	369,861	1922.....	354,910	359,292	1926.....	330,140	412,250
1919.....	481,251	414,758	1923.....	362,265	371,440	1927.....	376,135	448,317
1920.....	435,736	447,409	1924.....	474,448	393,093			
1921.....	447,062	479,655	1925.....	398,282	383,986			

NOTE.—Data from Anuario Estadístico de la República de Chile.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The railway runs from 10 meters above sea level at Concepcion to 156 meters at Descabezado which is the highest point.

Gage.—The gage of the line is 1.676 meters.

Curves.—The minimum curve radius on the line is 110 meters.

Grades.—The maximum up grade is 16.3 per 100 for a distance of 1,633 meters, while the maximum down grade is 15.5 per 100 for 535 meters.

Ties.—Wooden ties, 2.80 by 0.25 by 0.15 meter spaced 1,635 to the kilometer, are used.

Rails.—Steel rails 7.33, 8.23, 9.15, and 10.98 meters in length, weighing 25 kilos to the meter, are used.

Fuel.—Coal is used for fuel. There are five fuel stations with a total capacity of 210 tons. Coal stations are located at an average distance apart of 24.6 kilometers.

Water stations.—There are 10 water stations with a total capacity of 3,590 hectoliters. Water stations are located 10.8 kilometers apart.

Maintenance.—The railway is kept in good condition.

Bridges.—There are 42 bridges with a total length of 4,127 meters. One of these bridges, 1,890 meters in length, crosses the Bio-Bio River, and is one of the longest in South America.

Culverts and small bridges.—There are 136 culverts and small bridges with a total length of 160 meters.

Employees.—There were 624 men employed during the calendar year 1927.

Tunnels and galleries.—There are 12 tunnels with a total length of 2,079 meters.

MOTIVE POWER AND ROLLING STOCK

During the calendar year 1927, the railroad had the following equipment in operation:

Locomotives.....	34	Baggage.....	5
		Freight cars:	
Passenger cars:		Box cars.....	44
First class.....	2	Cattle cars.....	14
Third class.....	8	Gondola cars.....	753
Miscellaneous coaches.....	7	Flat cars.....	32
Auto-rail cars.....	2	Special cars.....	2
Total.....	19	Total.....	845

RAILWAYS OF MINOR IMPORTANCE

LOS ALAMOS-TRIHUECO RAILWAY

(Cia. Carbonifera Trihueco; Cia. Carbonifera de Los Alamos)

Under date of October 6, 1922, decree No. 507 authorized the Cia. Carbonifera de los Alamos (Los Alamos Coal Co.) to construct and operate a railway between Trihueco and the Los Alamos station of the Lebu a Los Sauces Railway in connection with its coal properties at Trihueco. Final plans for the route were approved by decree No. 425 of June 2, 1924. The original decree authorizing this construction reads as follows:

ARTICLE 1. Without prejudice to third parties, there is granted to the Cia. Carbonifera de los Alamos (Los Alamos Coal Co.) permission to construct and operate a railway between Trihueco and the Los Alamos station of the Lebu a Los Sauces Railway.

ART. 2. The gage of this railway shall be 0.60 meters and its approximate length 6.5 kilometers.

ART. 3. The final plans and construction estimates shall be submitted for approval to the Government within a period of four months beginning with the date of this decree. The construction rules shall be as established in decree No. 396 of September 22, 1916, for railroads of the third class, with a gage of 1.68 meters.

ART. 4. The transfer shipment facilities to be located within the premises of the Lebu a Los Sauces Railway shall be constructed in accordance with a plan agreed upon mutually between the said railroad and the concessionaire, and must be previously approved by the Government.

ART. 5. The construction work must be begun within a period of three months and be completed within six months, both periods beginning with the date the plans were approved.

ART. 6. The Government may purchase the railway and all its equipment at any time, whether during the period of construction or operation, upon payment of the price fixed by experts.

ART. 7. This concession is valid for a period of 90 years from the date it is granted, after which time the railway and its equipment shall become the property of the Government, without charge or obligation of any kind.

ART. 8. A certificate of deposit for 1,000 pesos to the order of the Minister de Ferrocarriles, as a guarantee of the bona fide nature of the application, shall be held as a guarantee of the construction of the railroad, for which this concession is granted.

ART. 9. If the railway, the object of this concession, is in the future destined for the transportation of passengers or freight of other proprietors, the Government may modify the conditions of this concession in accordance with the rules adopted for concessions for lines for public service.

ART. 10. The construction and operation of the railway are subject to the Ley de Policia de Ferrocarriles of August 6, 1862, and to all other regulations of a general character that have been or will be issued in the future concerning this matter, as well as to the use of public roads by railroads, and especially to the provisions of articles 63 to 71 of the highway law.

ART. 11. This concession shall become void if any of the periods of time or conditions established are not complied with as specified in this decree. In the event the concession becomes void, the guaranty deposit referred to in article 8 of this decree shall be retained by the Treasury Department.

ART. 12. The director of the treasury, as the representative of his department, is authorized, within three months from this date, to sign with the legally authorized representatives of the concessionaire, or the concessionaire himself, the public document which must be executed according to this decree.

An authorized copy of this public document must be delivered by the concessionaire to the Ministerio de Ferrocarriles.

Register, communicate, publish, and insert in the Boletín de las Leyes y Decretos del Gobierno (Bulletin of the Laws and Decrees of the Government).

Under the above decree, the railway was constructed and placed in operation, a distance of 6.5 kilometers from Trihueco to Los Alamos. The Cia. Carbonifera de Los Alamos operated the railway up to about three years ago when it was turned over to the Cia. Carbonifera

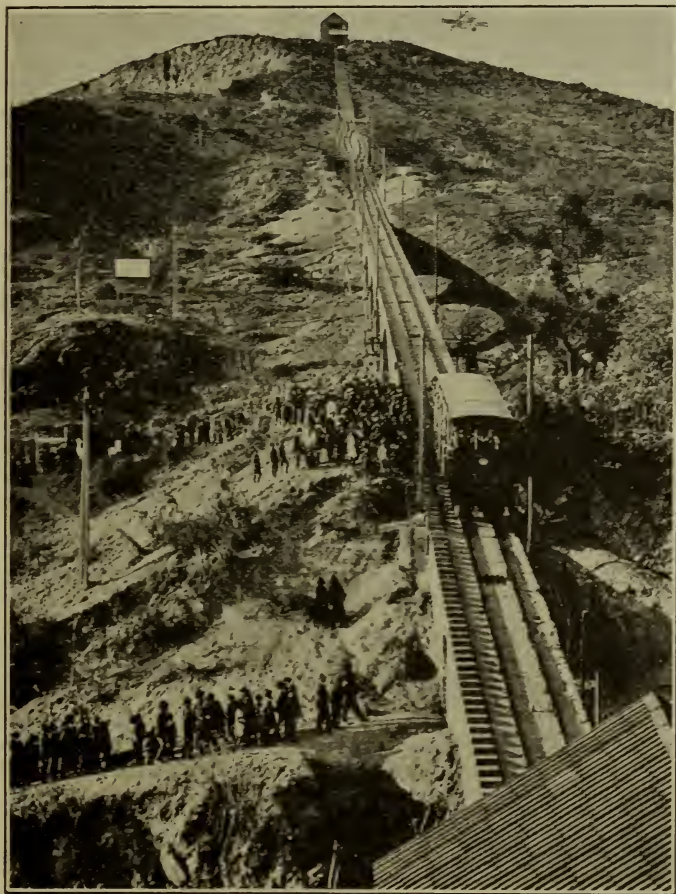


FIGURE 46.—The San Cristobal Funicular Railway

Trihueco and the company dissolved by the following decree which was translated from the Diario Oficial of Chile, April 20, 1928.

DISSOLUTION OF THE COMPANY KNOWN AS COMPAÑIA CARBONIFERA
LOS ALAMOS

Santiago, February 27, 1928. The following was decreed this date:

No. 525.—In view of the foregoing petition of Gustavo Boetsch, for the Compañía Carbonifera los Alamos, requesting the liquidation and dissolution of the said company, in conformity with the public document attached thereto, which was executed on November 16, 1927, before the local notary, Fernando Errazuriz Tagle,

Considering the information furnished by the Dirección General de Impuestos Internos (General Directorate of Internal Taxes), by the Consejo de Defensa Fiscal and the Superintendencia de Compañías de Seguros (Board of Supervisors of Insurance Companies) I decree:

1. The dissolution and liquidation of the Compañía Carbonífera los Alamos is authorized in conformity with the public document attached thereto which was executed on November 16, 1927, before Fernando Errazuriz Tagle, notary of this city.

2. It is ordered that the provisions of article 440 of the Code of Commerce be enforced.

Note, communicate, and publish. O. C. Ibanez C., Pablo Ramirez.

In Santiago, Chile, on November 16, 1927, before me, Fernando Errazuriz Tagle, notary public, and the witnesses mentioned below, appeared Gustavo Boetsch, a Chilean, married, engineer, of Agustinas Street No. 1055, an adult, to me well-known, who deposed as stated in the public document quoted below:

Fifth extraordinary general meeting of shareholders.

In Santiago, Chile, on November 15, 1927, at 12.15 p. m. at No. 696 Monjitas Street, after three prior notices and publications in conformity with the statutes, an extraordinary general meeting of the shareholders of the Compañía Carbonífera de Los Alamos was held. This meeting was called by three shareholders who represent more than one-fourth of the shares issued and was attended by the following shareholders:

Luis Pinto, in person, 500 shares; Domingo Calva, 35,900 shares; Gustavo Boetsch, in person, 32,000 shares; Carlos Miller, in person, 24,000 shares. Total, 91,500 shares.

As this is the third notice and the notary of this department, Fernando Errazuriz Tagle, was present, the meeting was called to order.

By unanimous choice, Gustavo Boetsch was designated chairman pro tem to preside over this meeting.

Carlos Miller stated to those present that the meeting had been called because the object for which the company had been organized no longer existed, since a part of its properties had been transferred to the Compañía Carbonífera Frihuco Limitada and that its remaining holdings could not be exploited due to the critical situation of the coal industry which deprived the company even of the resources necessary to carry on the proper exploring work at the coal deposits.

These conditions prompted the following statement:

The general meeting of shareholders of the Compañía Carbonífera de los Alamos agrees to the dissolution of the company prior to the expiration of its charter.

After the usual discussion, the dissolution of the company was approved by unanimous vote.

In conformity with article 60 of the statutes, the following shareholders were appointed liquidators by unanimous vote: Ignacio Ureta, Federico Barahona, and Luis Pinto.

Gustavo Boetsch was also authorized to execute a public document of this matter without awaiting the approval of the supreme court and its order declaring the company dissolved and in process of liquidation.

All persons present agreed to sign the aforesaid statement, and other documents required of such meetings.

The meeting adjourned at 1 p. m.—Gustavo Boetsch, L. Pinto, Carlos Miller, F. Errazuriz Tagle.

Notice.—Carlos Miller, G. Boetsch, and D. Calvo notify the shareholders of the Compañía Carbonífera de Los Alamos for the third time to attend an extraordinary general meeting to approve the dissolution of the company at No. 696 Monjitas Street, on the 15th of this month at 12 noon.

The undersigned notary certifies that in his presence there was held the fifth extraordinary general meeting of the shareholders of the Compañía Carbonífera de Los Alamos on this date and the matters referred to in this document were discussed there; that this meeting was held in conformity with the provisions of the statutes and the three notices required were published in the "Diario Ilustrado" of this city, on the 9th, 10th, 11th, 12th, 13th, 14th, and 15th of November, this year, that the credentials submitted were considered satisfactory and the meeting was called to order. Santiago, November 15, 1927. F. Errazuriz Tagle.

This is certified as being a true copy of the respective entry in the records of the Compañía Carbonífera de Los Alamos.

In witness whereof he signs, in the presence of the witnesses, Luis A. Prado and Emilio Rodriguez.

Copy issued upon payment of the tax of two pesos.

Certified by Gustavo Boetsch, L A. Prado, Emilio Rodriguez C., F. Errazuriz Tagle.

Executed in my presence. Witness my hand and seal: F. Errazuriz Tagle, notary public.

As of possible interest it might be stated that this railway was built for the sole purpose of transporting coal from the mines to the railway station. The railway was of 0.62 meter gage and ran through practically level country, the highest point of elevation being about 250 meters above sea level. The minimum curve radius of the railway was 15 meters while rails weighing 12 kilograms to the meter, in 5 meter sections, were used. At the time it was abandoned the railway had 1 Koppel 30-horse power locomotive and 14 open wooden cars each of 8 tons capacity as its equipment.

CARRIZAL & CERRO BLANCO RAILWAY

(Ferrocaril de Carrizal y Cerro Blanco; Carrizal-Yerba Buena Railway)

The history of this railway dates back to 1865 when it was organized to take over an existing animal traction line, extending from the Port of Carrizal to Carrizal Alto, a distance of approximately 40 kilometers. From that point it was extended to Yerba Buena, an additional distance of 60 kilometers. In 1880, a branch line was constructed to Merceditas, a distance of about 1 kilometer and later an additional branch was constructed to Manganese. At the present time the railway is owned by a company known as the Ferrocarril de Carrizal y Cerro Blanco, of which W. W. Robinson, 639 Cochrane Street, Casilla 1570, Valparaiso, is secretary, and in charge of its affairs in Chile. The majority of the stockholders of the company are of British nationality. The railway now is leased to the American Smelting & Refining Co., of New York City, although it is not being operated, owing to the closing of the copper mines which provided this railway with the majority of its freight. On November 11, 1922, an earthquake and tidal wave practically destroyed the shops of the railways at Carrizal in addition to many of the locomotives and other property. Since that time, only an occasional train is run over the line, and that for the purpose of bringing water and supplies to the caretakers at the mines. The road is of 1.270 meter gage, has seven bridges totaling 90 meters in length, and 28 culverts aggregating 118 meters. In 1923 a request was made by the owner, for bids for the sale of the rolling stock and equipment. This action immediately brought about a storm of protest from the mining industry and representatives were appointed to call on the Minister of Public Works and explain that the operation of this railway, whether as a private or Government enterprise was essential to the mining industry in that district. During that year the company had outstanding 1,500,000 paper pesos capital stock of a par value of 500 paper pesos of which 22,600 shares were held in England and 378 shares in Chile.

FERROCARRIL CALDERA AL ALGARROBO

The history of this railway dates from 1903 when the Comunidad Minera de la Viuda was authorized to construct a railway from the Algarrobo mines to the port of Caldera, a distance of 39 kilometers.

The line was opened to traffic in 1905 and no additional mileage had been constructed to the end of 1927. At the present time the line is owned by the Compañía American Smelting, a Chilean corporation, which is controlled by the American Smelting & Refining Co. of 120 Broadway, New York City. The line is now operated very irregularly, having about one train a month with some 30 tons of freight. It has no officials and in recent years has purchased little equipment.

FINANCES

The company is capitalized at 50,000 pesos. Operating revenues and operating expenses of this railway for the calendar years 1918 to 1927, inclusive, are as shown in the following table:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1918.....	81,417	75,210	6,207	-----	1923.....	74,904	67,977	6,927	-----
1919.....	50,865	57,345	-----	6,480	1924.....	49,404	40,005	9,399	-----
1920.....	88,569	152,070	-----	63,501	1925.....	23,145	33,036	-----	9,891
1921.....	46,422	37,098	9,324	-----	1926.....	1,007	7,153	-----	6,146
1922.....	70,041	51,072	18,969	-----	1927.....	1,888	5,222	-----	3,334

NOTE.—Data from Estadística de los Ferrocarriles en Explotación, 1927.

TRAFFIC

The number of passengers and amount of freight carried by the railway during the calendar years 1918 to 1927, inclusive, was as shown in the following table:

Year	Passen- gers car- ried	Freight carried	Year	Passen- gers car- ried	Freight carried	Year	Passen- gers car- ried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1918.....	-----	3,311	1922.....	1,350	14,375	1926.....	2	82
1919.....	-----	3,374	1923.....	-----	3,304	1927.....	10	140
1920.....	1,350	4,138	1924.....	426	4,004			
1921.....	649	2,825	1925.....	239	1,844			

¹ Anuario Estadístico de la República de Chile.

² 1927 data, Estadística Anual de la República de Chile.

NOTE.—Data from Estadística de los Ferrocarriles en Explotación 1927.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The railway is of 0.762-meter gage.

Grades.—The maximum upgrade is 3.5 per 100 for 2,000 meters.

Curves.—The radius of the minimum curve on the line is 35 meters.

Rails.—Steel rails, weighing 8 and 12 kilograms per meter, in 5 and 7 meter sections, are used.

Ties.—Ties are of roble pellin, secured locally. They are 1.80 by 0.20 by 0.12 meters and are spaced 1,720 to the kilometer.

Water.—There is one water station on the line.

Fuel.—Coal is used for fuel. There is one coal station on the line.

Maintenance.—The condition of the railway is sufficient to handle the required traffic.

Employees.—The railway employed six men at the end of the calendar year 1926.

Bridges.—There are no bridges on the line.

Tunnels.—There are no tunnels on the line.

MOTIVE POWER AND ROLLING STOCK

The railway had the following motive power and rolling stock in operation during the calendar year 1927:

Locomotives.....	2
Passenger cars (miscellaneous).....	2
Freight cars:	
Gondola.....	28
Flat.....	2
Special.....	8

FERROCARRIL MELIPILLA A IBACACHE

(Ferrocarril Melipilla a Curacavi)

The construction of this railway was undertaken in 1920 by a private corporation called the "Sociedad Ferrocarril de Melipilla a Curacavi" under the auspices of Eduardo Valdivieso Valdez. It was originally intended to extend the line to Curacavi but up to the present it has only been constructed as far as Ibacache. Approximately 1,000,000 pesos was spent in its construction. The railway was placed in operation in 1922 and has 28 kilometers of main-line track from Melipilla to Ibacache. In addition there are 1.6 kilometers of branch track in operation. In 1925, Claudio Matte obtained control of the company and at this time is the principal owner.

Eduardo Valdivieso Valdez is the general manager of the railway and also does all its purchasing. The main office is located at Edificio Diaz, Santiago.

FINANCES

Although no financial reports are available, the company claims that the capital of the railway is 2,300,000 pesos, while according to the Chilean Government statistics the capital at the end of the calendar year 1927 was 2,158,558 pesos. The operating revenues and expenses of the railway during the calendar years 1923 to 1927 were as shown in the following table:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1923.....	105,561	91,614	13,947		1925.....	139,362	311,843		172,438
1924.....	132,951	72,972	59,979		1927.....	147,333	539,331		391,997
1925.....	95,259	126,902		31,643					

NOTE.—Data from Estadístico Anuario de la República de Chile.

TRAFFIC

The railway has shown an increase in traffic during the past two years, particularly since the installation of the gasoline motor cars. The following table indicates the number of passengers and amount of freight carried by the railway during the calendar years 1923 to 1926 and the fiscal years 1925–26 to 1927–28:

Year	Passengers carried	Freight carried	Year	Passengers carried	Freight carried	Year	Passengers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1923 ¹		10,600	1926 ¹	24,754	20,040	1926–27 ²	23,000	19,995
1924 ¹	24,200	17,639	1927 ¹	24,970	18,268	1927–28 ²	25,000	18,330
1925 ¹	18,231	14,320	1925–26 ²	18,000	14,320			

¹ Estadístico de los Ferrocarriles de Chile en Explotación.

² Statistics furnished by general manager of railway.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the railway is 0.75 meter.

Grades.—The maximum upgrade on the system is 9 per 100 for 970 meters while the maximum down grade is 8 per 100 for 650 meters.

Curves.—The minimum curve radius is 100 meters.

Rails.—Steel rails, weighing 14 kilograms per meter, in 7-meter sections are used.

Ties.—Ties of roble pellin, secured locally, 1.30 by 0.15 by 0.20 meters and 0.10 by 0.15 by 1.40 meters, spaced 1,400 to the kilometer are used.

Water.—There are four water stations with a total capacity of 3,000 hectoliters. They are spaced an average distance apart of 7 kilometers.

Fuel.—Coal is used for fuel. There is one coal station with a capacity of 40 tons.

Maintenance.—The railway is kept in fair condition.

Ballast.—Small river-bottom stones are used for ballast.

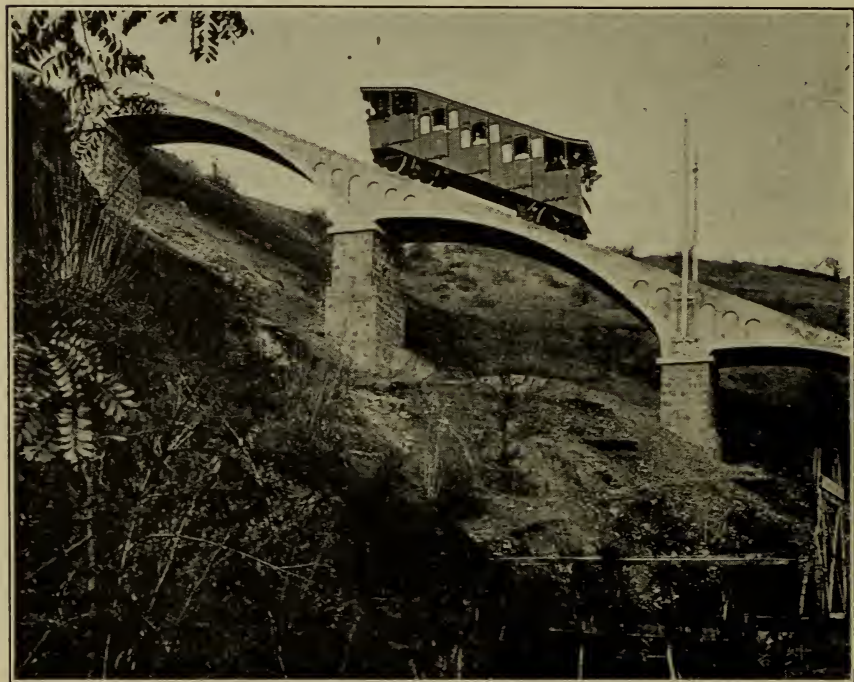


FIGURE 47.—View of the San Cristobal Funicular Railway

Employees.—At the end of 1928, seven men were employed for operation and three in an administrative capacity.

Culverts and small bridges.—There are 66 culverts along the line with a total length of 264 meters.

Bridges.—There are three wooden bridges with a total length of 144 meters.

Tunnels.—There are no tunnels.

MOTIVE POWER AND ROLLING STOCK

At the end of June, 1928, the company had three locomotives in operation. Two of these locomotives weighed $10\frac{1}{2}$ tons each while the other weighed 18 tons.

The rolling stock consists of 1 baggage car of 10 tons capacity, 10 freight cars with a capacity of 10 tons each (5 of these cars were imported from Germany while the remainder were of local construction), and 3 American gasoline cars (1 is a Brockway and two are

Fords). These gasoline cars are used exclusively for passenger and express service.

REPAIR SHOPS

There is one repair shop located at Melipilla which is equipped with only the most simple tools. When heavy repairs are necessary, parts are sent to a foundry or machine shop.

FERROCARRIL VILLA INDUSTRIAL A TACORA

In 1925, the firm of Espada & Donoso, Casilla 197, Arica, built a 25-kilometer industrial railway to carry sulphur obtained from the deposits on the slopes of Mount Tacora, near the Chilean-Bolivian border, to kilometer 165 of the Arica-La Paz Railway. The manager of the company is Manuel Donoso while the purchasing agents are the Espada Hnos, who should be addressed at Tacna.

In the middle of 1928, the company was operating two 50-ton steam locomotives and twelve 6-ton freight cars, all of German manufacture.

PUERTO & BALNEARIO QUINTERO RAILWAY

(San Pedro a Quinteros Railway)

The history of this railway dates from January 24, 1912, when a concession was granted to Don Alberto Cousino to construct a line connecting the port of Quintero with Nogales on the Chilean State Railways. A copy of this concession follows:

LAW NO. 2623

Whereas the National Congress has approved the following bill:

ARTICLE 1. There is granted to Don Alberto Cousino, or his legal representative:

(1) A concession to construct and operate a steam railway or electric railway with a 1-meter gage, starting from the port of Quintero and connecting at Nogales station with the Calera line to the north of the Ferrocarriles del Estado (State Railways).

(2) The free use of the Government lands needed to construct the railway, stations, switches, warehouses, shops, and other buildings required for operating the line, in conformity with the plans approved by the President of the Republic.

(3) The use of public and rural highways at the places where they cross the line, provided that this use does not impede or embarrass public traffic.

(4) The authority to drill wells and use springs for the locomotives and other purposes, it being understood that only the water consumed by the concessionaire shall be considered as his property.

It is understood that the use of springs and the drilling of wells shall not prejudice the right of third parties.

This concession shall be gratuitous on the Government lands.

(5) A concession to construct at the port of Quintero a terminal wharf with such a capacity that steamers having a 30-foot draught can come alongside of it. The concessionaire must comply with the conditions established by the President of the Republic for operating this wharf.

(6) The use of the southwest part of the bay and coast of the port of Quintero which may be indispensable for the construction of docks, moles, and other works pertaining thereto and used for building and tarring vessels, according to the plans approved by the President of the Republic.

The places intended for loading barges in the bay must have a length of 200 meters.

ART. 2. Municipal and private lands needed for the location of the line, the stations, and other equipment, as well as for the construction of the docks, wharfs, moles, and similar works, in conformity with the plans approved by the President of the Republic, shall be declared public utility property. The concessionaire must pay for the expropriation of the lands.

ART. 3. Upon the completion of the wharfs, docks, moles, and railway, the concessionaire shall be reimbursed for the duties paid for the import of material used for the said works. The reimbursement shall be made separately upon the completion of each of these works and the total amount of duties reimbursed may not exceed 150,000 pesos in national money, irrespective of the actual amount of duties paid.

ART. 4. The plans of the railway and other works referred to in this concession, which plans must indicate the extension of the bay and coast mentioned in section 6 of Article 1, must be submitted for the approval of the President of the Republic within a period of six months, beginning with the date of the promulgation of this law. The construction works must be begun within a period of 18 months and the works must be completed and delivered to public service within a space of five years, both periods to begin on the date of approval of the plans. If the President of the Republic does not decree any modifications within three months after the plans were submitted, the said plans shall be considered as approved and the concessionaire may begin the construction of the works.

Likewise, the plans of the town of Quintero must be submitted for the approval of the President of the Republic.

For public use, the concessionaire must transfer to the state gratuitously a tract of land measuring 60,000 square meters, distributed in the manner ordered by the President of the Republic.

The plans of the town must provide for two public squares with an area of at least 15,625 square meters each.

As soon as this agreement has been converted into a public document, there shall be established the period within which the said works must be completed. The said period shall be set by the President of the Republic and may not exceed the period of the concession.

ART. 5. All concessions shall become invalid if the plans are not submitted to the President of the Republic, or if the works are not begun within the periods established by the preceding article.

The concession shall also be invalid if the works are not completed within the period set by the aforesaid article.

ART. 6. The passenger and freight rates must be submitted for the approval of the President of the Republic.

ART. 7. The concessions granted by this law shall be valid for a period of 50 years, beginning with the date on which the works must be completed and opened to public service.

After the expiration of the aforesaid period, the docks, wharfs, moles, and other works connected with the port, as well as the railway and its equipment, stations, and other paraphernalia shall become the property of the state without the latter's incurring any obligation therefor.

ART. 8. After this concession has been in effect for 20 years, the state may acquire the railway and Quintero port works at a fair valuation established by experts. All expenses incurred by the state in connection with this law shall be deducted from the purchasing price.

In the event that the state acquires ownership of the port works before the termination of the concession, Mr. Cousino, or his legal representative, must renounce all other concessions granted him and which were not contemplated in this law.

ART. 9. The State shall guarantee interest of 5 per cent per annum and an accumulative amortization of 1 per cent yearly on the capital invested in the construction of the railway, in conformity with the plans and estimates approved by the President of the Republic.

The maximum capital investment which will be guaranteed is fixed at 1,500,000 pesos of 18 pence.

This guaranty shall become effective when the works are opened to public service, and from that time the state shall be entitled to intervene in the administration of the railway. The guaranty shall cease as soon as the capital has been amortized. The guaranty shall also cease if the other concessions granted by this law become invalid.

If the net profit of the railway exceeds by 6 per cent the capital invested in the construction of the railway, the balance shall be turned over to the state until it makes up the amount necessary to reimburse the state for the sums paid by it in compliance with its guarantee obligation.

The state shall not in any case be liable for the losses of the railway.

ART. 10. If on the date the guaranty ceases the state has not recovered the sums paid for this service, the concessionaire must deposit the balance due with the arcas fiscales (treasury).

To assure compliance with this obligation, the railway with all its equipment and 1,000,000 square meters of land owned by the concessionaire within the town of Quintero, shall be mortgaged. However, the said concessionaire may dispose of the mortgaged lands before he is freed from his liabilities, provided that he deposits to the order of the director of the treasury a sum of 1 peso, in gold of 18 pence, for each square meter of land sold.

Upon converting this law into a public document as aforesaid, there shall be a demarcation of the said property for the purpose of registering the mortgage held thereon in the *registro conservador de bienes raíces* (real estate register).

ART. 11. The rights conferred by this law may be transferred only to natural or legal persons domiciled in Chile, with the approval of the President of the Republic.

The concessionaire and persons representing his rights, even if foreigners, shall be subject to the laws and tribunals of this nation, as if they were Chilean citizens, in all matters connected with the concession. It is understood that the said persons, or those who acquire their rights, may not have recourse to diplomatic intervention because of any controversy originating from the said concession.

And whereas, in view of the recommendation of the *consejo de estado* (council of state), I have approved and ratified this law, therefore, I order its promulgation and complete enforcement, as a law of the Republic.

RAMON BARROS LUCO.
ABRAHAM A. OVALLE.

SANTIAGO, JANUARY 24, 1912.

In 1913, the *Ferrocarril Puerto & Balneario Quintero Sociedad Anonima* was organized under Chilean laws to construct this railway. Certain sections of it were opened to traffic in 1921, but it was not until March 14, 1926, that the complete line was opened. The railway had 39 kilometers in operation at the end of the calendar year 1929.

The general manager of the railway is Vicente Izquierdo, who should be addressed, in reference to purchases, in care of the railway at Estado 91, Santiago.

FINANCES

The state guarantees 5 per cent interest and 1 per cent accumulative amortization on capital expenditure up to 1,500,000 gold pesos at 1s. 6d., guaranty to cease as soon as capital is amortized or in event of lapse of other concessions granted by same law, and state to have power to intervene in management of railway during currency of guaranty. Whenever net profit exceeds 6 per cent on capital employed in construction, balance is to be handed to state to reimburse it for payments in fulfillment of guaranty obligation.

Authorized share capital, 10,000,000 pesos; issued and paid up, 7,700,000 pesos; bonds outstanding, £186,562 10s.

Shares, 4,200,000 pesos, A shares of \$100, fully paid; 3,500,000 pesos, B shares of \$100, fully paid.

Bonds: £180,000 (7,200,000 pesos at 6d.) 5 per cent bonds of £37 10s. (1,500 pesos at 6d.) and £75 (3,000 pesos at 6d.), outstanding balance of £187,500 (7,500,000 pesos at 6d.), of which £186,562 10s. was purchased by Anglo-South American Bank (Ltd.) at 76¾ per cent in June, 1926, and countersigned by it. Authorized, 7,500,000 pesos at 6d. Interest March 31 and September 30. Redeemable by 1963; annual cumulative sinking fund provided of 1 per cent applicable to drawings at par on March 31 and September 30 (began March 31, 1926). Principal, interest, and sinking fund guaranteed by Republic of Chile. Principal and interest payable in Valparaíso or in sterling in London at Anglo-South American Bank (Ltd.), Old Broad Street, E. C. 2.

The operating revenues and expenses of the sections of the railway open during the calendar years 1921 to 1927, inclusive, were as shown in the following table:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1921-----	64,248	353,291	-----	289,043	1924-----	121,596	138,756	-----	17,160
1922-----	128,862	104,862	24,000	-----	1925-----	121,596	138,756	-----	17,160
1923-----	136,377	111,075	25,302	-----	1927 ¹ -----	207,028	86,114	120,914	-----

¹ Estadística Anual de la República de Chile, 1927.

NOTE.—Data from Estadística de los Ferrocarriles de Chile en Explotación. No data for 1926.

TRAFFIC

The following table indicates the number of passengers and amount of freight carried by the sections of the line which were in operation during the calendar years 1921 to 1927, inclusive:

Year	Passengers carried	Freight carried	Year	Passengers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1921-----	-----	30,808	1924-----	14,753	9,550
1922-----	10,378	-----	1925-----	14,753	9,550
1923-----	13,412	-----	1927-----	17,186	2,280

NOTE.—No data for 1926.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the railway is 1.676 meters.

Water.—There are two water stations with a total capacity of 100 hectolitres.

Fuel.—Coal is used as fuel. There is one coal station with a total capacity of 300 tons.

Maintenance.—The railway is kept in fair condition.

Employees.—The railway employed 52 men at the end of the calendar year 1927.

Bridges.—There are 17 bridges on the line, with a total length of 490 meters.

Tunnels.—There are no tunnels on the line.

MOTIVE POWER AND ROLLING STOCK¹

The motive power and rolling stock in operation at the end of the calendar year 1927 was as follows:

Locomotives-----	1	Freight cars:	
Passenger cars:		Flat cars-----	8
First class-----	1	Cattle cars-----	3
Third class-----	1	Gondola cars-----	2
Auto-rail cars-----	2	Miscellaneous-----	2
Miscellaneous-----	1		

PUNTA ARENAS TO MINA LORETO RAILWAY

(Loreto Coal Mine Railway; Sociedad Anonima Ganadera y Comercial "Menendez Behety")

This railway was constructed during the years 1898–1900, to connect the coal mine known as Mina Loreto with the Port of Punta Arenas, a distance of 8.5 kilometers. At the present time the railway and mine are owned by the Sociedad Anonima Ganaderos y Comercial "Menendez Behety," located in Punta Arenas. This company was

¹ From Estadística Anual de la República de Chile.

established in 1914. There are no plans for any immediate extension to this line which at the end of 1927 had 10.2 kilometers of track in operation.

PURCHASES

Purchases are generally made, as designated by the manager of the railway, Juan Dietert, through Duncan, Fox & Co., which has offices both in New York and London. Their New York office is located at 42 Broadway, New York City. The railway should be addressed in care of Sociedad Anonima Com. y Ganadera "Menendez Behety," Punta Arenas, Chile.

FINANCES

The company was capitalized at 756,829 pesos at the end of 1927. The following table shows the receipts and expenses for the railway during the calendar years, 1919 to 1926, inclusive:

Year	Receipts	Expenses	Gains	Losses	Year	Receipts	Expenses	Gains	Losses
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1919-----	194,919	196,464		1,545	1923-----	173,902	183,570		109,668
1920-----	285,564	206,832	78,732		1924-----	197,047	108,342		11,295
1921-----	175,518	155,874	19,644		1925-----	103,556	118,483		14,927
1922-----	128,629	110,635	17,994		1926-----	92,654	110,464		17,809

¹ From Anuario Estadística de la República de Chile, 1926.

TRAFFIC

Four trains are operated between the mine and the port daily, carrying about 121 tons. The following table shows the traffic of the railway during the calendar years 1919 to 1927, inclusive:

Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried	Year	Passen- gers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1919-----		38,719	1922-----		23,739	1925-----		34,234
1920-----		45,347	1923-----		29,530	1926-----		36,323
1921-----		120,655	1924-----	12,200	132,793	1927-----		40,651

¹ Anuario Estadística de la República de Chile.

NOTE.—Data from Estadística de los Ferrocarriles de Chile en Explotación.

RIGHT-OF-WAY CHARACTERISTICS

Altitude.—The highest point along the line is 160 meters above sea level.

Gage.—The railway is of 1-meter gage.

Grades.—The maximum upgrade on the line is 33 per 100 for 500 meters.

Curves.—The minimum curve radius on the line is 40 meters.

Ties.—Wooden ties, obtained locally, are used. The ties are 0.15 by 0.2 by 2 meters and are spaced 1,150 to the kilometer.

Rails.—Steel rails, weighing 21 kilograms per meter and 6 meters in length, are used. The rail is 4 inches high, 2 inches across the face, and has 3¼-inch flange.

Water.—There are two water stations having a total capacity of 40 hectoliters. These stations are located at an average distance apart of 4.2 kilometers.

Fuel.—Coal is used for fuel. There is one fuel station on the line, having a total capacity of 1,200 tons.

Maintenance.—The line is kept in good condition.

Employees.—During the calendar year 1927, the railway employed 19 men.

Bridges.—There are four bridges along the right of way, totaling 70 meters in length.

Tunnels.—There are no tunnels on the line.

MOTIVE POWER AND ROLLING STOCK

For the calendar year 1927, the railway had 4 locomotives, 88 freight cars, and 4 passenger cars in operation. The locomotives were of tank type, Baldwin and Koppel manufacture weighing 28,000 and 40,000 pounds, and have cylinders 9 by 14 inches, anchor 1 by 16 inches, respectively. The cars are of both the flat and dump car type.

CERRO SAN CRISTOBAL CABLE RAILWAY

(Funicular San Cristobal of Santiago)

The Government granted a concession to the Societe Anóninia Funicular San Cristobal in 1924 to construct a cable railway up the side of the Cerro San Cristobal in Santiago. The company was incorporated for 1,200,000 pesos, practically all of which was subscribed to by Italians. The cableway was completed and placed in operation in 1926. At the present time it is 485 meters in length, and is a single-line system with the exception of one short turnout. The line extends from the foot to the summit of the San Cristobal Mountain. It is used exclusively for the carriage of passengers.

OPERATING OFFICIALS AND PURCHASES

Don Emilio Cintolesi and Don José Consiglio are the operating officials for the cableway and all purchasing is done by them. The office of the company is located at Estación Pio None and its postal address is Casilla 2645, Santiago, Chile.

FINANCES

The balance sheet and revenue account of the company for the fiscal year ended June 30, 1926, are shown in the following statements:

FINANCIAL STATISTICS FOR FISCAL YEAR ENDED JUNE 30, 1926

	Pesos
Operating revenues.....	388, 863. 70
Other revenues.....	26, 460. 09
Operating expenses.....	152, 279. 63
Other expenses.....	7, 122. 00 .

BALANCE SHEET FOR FISCAL YEAR ENDED JUNE 30, 1926

LIABILITIES		Pesos
Capital.....	1, 200, 000. 00	
Accounts payable.....	21, 862. 00	
Dividends due, unpaid.....	5, 685. 00	
Dividend fund.....	10, 230. 00	
Reserve fund.....	3, 690. 88	
Depreciation reserve.....	22, 087. 00	
Bills payable.....	8, 580. 00	
Balance of profit and loss account.....	255, 922. 00	
		1, 527, 957. 88

ASSETS

	Pesos
Buildings and plant.....	1, 049, 410. 42
Organization and formation expenses.....	161, 006. 79
Furniture.....	25, 252. 40
Accounts receivable.....	33, 245. 80

Cash:	Pesos
Banco Italiano.....	5,044. 85
Office.....	5,693. 81
Dividends due on investments.....	112,800. 00
Bills receivable.....	113,691. 11
Materials and tools.....	20,962. 70
Pending operations.....	850. 00
	<hr/> 1,527,957. 88

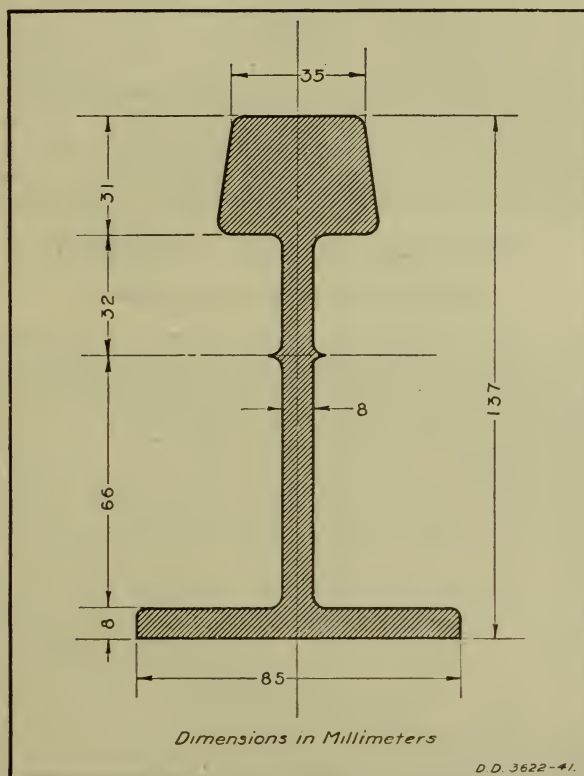


FIGURE 48.—Rail profile, San Cristobal Funicular Railway

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the cableway is 1 meter.

Grades.—The maximum grades on the cableway vary between 32 and 70 per cent.

Rails.—Rails, 8.85 meters in length, similar to the accompanying sketch, are used.

Ties.—Angle-iron ties, 12 by 12 by 1.62 meters, spaced on 1 meter centers in a layer of concrete 30 centimeters thick, are used.

Bridges.—There are three bridges along the line. One bridge is constructed of reinforced concrete, has three arches, and is 59 meters in length. The other two are of stone construction, $2\frac{1}{2}$ and $1\frac{1}{2}$ meters in length, respectively.

Employees.—The company has 19 employees.

REPAIR SHOPS

There is one repair shop which is equipped to handle small repair work but all heavy repairs are made by outside machine shops.

ROLLING STOCK

In June, 1928, the company operated six passenger cars, manufactured by Ceretti y Tanfani, Milan, Italy. These cars have a seating capacity for 24 people with a maximum carrying capacity of 40 people each. The cars are fitted with automatic brakes and are drawn by an electric wench located at the head of the line.

FERROCARRIL DE LA SOCIEDAD EXPLOTADORA DE TIERRA DEL FUEGO

This railway established in 1893 by the Sociedad Explotadora de Tierra del Fuego, is 4.8 kilometers in length extending from the town of Natales which is 289.6 kilometers northwest of Punta Arenas, to the freezing works owned by this company. The railway is used for the transportation of workmen to and from Natales. All purchases are made through the office of the company at Tierra del Fuego.

FERROCARRIL YUNGAY A PUDAHUEL

(Ferrocarril de Yungay Barrancas y Pudahuel)

Construction of this railway, which was first commenced in 1910 by a French citizen, Eugenio Cibie, was completed in 1911. Originally it was called the Ferrocarril de Yungay Barrancas y Pudahuel and was designed to carry freight and passengers by means of steam traction. At this time it was believed that mining operations were to be inaugurated in the area which it would serve. This project was never developed and as a result the amount of freight originating in the territory was too small to permit of its successful operation. Senor Cibie died the latter part of 1921 and in 1922 the railway was sold to Emilio Centolesi, who converted it from steam to gasoline traction and gradually ceased freight operations. It is now classified as an Italian company. The line was 17.2 kilometers in length at the end of the calendar year 1927. This included 2.2 kilometers of sidings. The railway connects Yungay with Pudahuel. The company is endeavoring to secure a concession from the Government which will permit a different routing of the railway, although it will still connect the two towns. If this concession is granted, it is expected that it will enable the company to secure additional passenger and freight traffic.

OPERATING OFFICIALS

The owner and general manager of the railway is Emilio Centolesi, who should be addressed at the office of the company at Calle Mapocho esq. Alcerreca, Yungay, Chile. All purchases are made by him through this office.

FINANCES

According to the present owner of the railway, its capitalization is 315,000 pesos, although according to the latest Government report, 1927, its capitalization is 252,504 pesos. The operating revenues and operating expenses of this railway during the calendar years 1923, 1924, 1925, and 1927 were as shown in the following table:

Year	Receipts	Expenses	Gains	Year	Receipts	Expenses	Gains
	<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>		<i>Pesos</i>	<i>Pesos</i>	<i>Pesos</i>
1923-----	233,643	197,317	36,326	1925-----	320,724	259,346	61,378
1924-----	255,630	211,980	43,650	1927-----	¹ 345,062	¹ 316,921	28,141

¹ From Estadística Anual de la República de Chile.

TRAFFIC

The following table shows the number of passengers and amount of freight carried by the railway during the calendar years, 1923, 1924, 1925, and 1927:

Year	Passengers carried	Freight carried	Year	Passengers carried	Freight carried
	<i>Number</i>	<i>Tons</i>		<i>Number</i>	<i>Tons</i>
1923-----	720,000	1,235	1925-----	1,435,962	356
1924-----	900,782	1,450	1927-----	¹ 1,316,639	-----

¹ Estadística Anual de la República de Chile.

NOTE.—Data from Estadístico de Ferrocarriles de Chile en Explotación.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The railway is 0.75-meter gage.

Curves.—The minimum curve radius is 39 meters.

Rails.—Six kilometers have steel rails weighing 12 kilograms per meter in 9-meter sections, and on 9 kilometers steel rails weighing 9 kilograms per meter are used.

Ties.—Roble pellin ties, 1.30 by 0.15 by 0.10 meters, spaced 2,000 to the kilometer, are used.

Fuel.—Gasoline is used for fuel. There is one gasoline station with a capacity of one ton.

Ballast.—River bottom stones are used for ballast for about half the length of the railway.

Maintenance.—The line is kept in good condition.

Employees.—During 1927, 23 men were employed.

Culverts and small bridges.—There are 28 culverts and small bridges with a total length of 70 meters.

Bridges.—There is one bridge, 12 meters in length.

Tunnels.—There are no tunnels in use.

MOTIVE POWER AND ROLLING STOCK

At the end of 1928 the company had in operation nine gasoline passenger cars (Fords). This equipment was acquired since 1923 and is considered to be in good condition. Recently an additional Ford chassis was purchased.

REPAIR SHOPS

There are two small repair shops located at Cerro Navia and Yungay. These shops are equipped for ordinary wear-and-tear repairs, and the one at Cerro Navia is also equipped with a carpenter shop where bodies for the gasoline cars are constructed.

FERROCARRIL DE CERRO GORDO A CHALLACOLLO

(Cerro Gordo to Challacollo Railway)

Construction of this railway was commenced in 1896 by the Compañía Minera y Beneficiadora de Cerro Gordo to connect its mining properties near Cerro Gordo with Challacollo, a distance of 35 kilometers. Service was inaugurated the following year. The railway, which was abandoned a few years ago, was of 0.76-meter gage and used rails weighing 10 kilograms to the meter.

PROPOSED RAILWAYS

This section is devoted to various railway projects, for some of which concessions have been granted. In certain instances the concessions have apparently lapsed, owing to the failure of the concessionaires to carry out their agreements with the Government. The projects outlined are those which are considered the more important, and even in the cases of those on which the concessions have lapsed it is thought that they either will be renewed or new concessions issued for the same routes.

In this connection it is interesting to note that at the beginning of 1928, the Chilean Government inaugurated a 6-year railway construction program, during which time they intend to spend approximately 183,000,000 pesos. Of the projects outlined at that time, approximately 34,897,000 pesos has already been allocated for the construction of the Loncoche-Villarrica railway, Quino-Galvarino railway, and Cocule to Lago Ranco railway. Additional lines which will be included in this program are the Rio Negro-Maullin, Puren-Peleco, and Hualane-Constitucion railways and the completion of the Antofagasta to Salta transandine railway.

The construction of these lines will open up a rich country and make possible the transportation of products from this region to the coast.

The Transandine projects are discussed in the section on transandine railways, while branch lines and additional mileage to be constructed by the various rail carriers which are already in operation will be found under the heading of the individual road.

PUERTO MONTT TO PUERTO TOLEDO RAILWAY

A concession was granted on February 13, 1923, to Leon Meershon, to construct a railway from Puerto Montt, the southern terminus of the Chilean State Railways, to Puerto Toledo, a distance of 40 kilometers. In May, 1924, an additional concession was granted to the original concessionaire for the extension of this railroad from Puerto Toledo to Rio Frio, a distance of 55 kilometers. The concessionaire has also applied for a third concession to extend from Rio Frio to Llico some distance westward, although this concession has not as yet been granted. It is estimated that the cost of the first two sections will approximate 3,500,000 pesos. The railway when constructed is to be of 1-meter gage. Translations of the concessions authorized in February, 1923, and May, 1924, follow:

DECREE: FEB. 15 1923

ARTICLE 1. Permission is granted, without interference of a third party, to Don Leon Meershon to construct and exploit a railroad which joins Puerto Montt with Puerto Toledo, situated at the confluence of the rivers Maullin and Gomez.

ART. 2. The gage of this railroad shall be 1 meter and its length approximately 40 kilometers, which shall be divided into four sections: The first, from

Puerto Montt to Lagunitas, about 9 kilometers; the second, from Lagunitas to Las Quemadas del Salto, about 13 kilometers; the third, from Las Quemadas del Salto to El Gato, about 9 kilometers; and the fourth, from El Gato to Puerto Toledo, about 9 kilometers.

ART. 3. Definite plans and estimates of construction shall be submitted for the approval of the Government within the following dates: One year for the first section, two for the second, and three and four, respectively, for the third and fourth; the time shall begin from the date of the present decree.

For the working plans the railway shall be considered in the category of general interest to which decree No. 477 of March 15, 1907, refers.

The standards of construction shall be those set forth in decree No. 396 of September 22, 1916, for the first-class railways of 1-meter gage.

ART. 4. The work of construction of the railway for each section shall begin within six months after the approval of the plans, provided that the department shall have consented to the concession of the fiscal lands necessary for the railroad, and it shall be finished within three years beginning from the same date.

ART. 5. The concessionaire should present to the department of railways, within six months after the date of the decree of approval of the definite plans, proof of having obtained the right for the necessary lands for the line and its annexes.

If it shall be necessary to run through fiscal lands, the concessionaire should solicit from the Secretary of the Treasury within the same time the permission necessary for its occupation.

ART. 6. (1) The concessionaire shall present at the end of the construction a descriptive report of the work and amount of initial expenses, classifying the different sections under the following headings:

- (a) Expenditures for information, organization, and administration.
- (b) Expropriation or acquisition of lands.
- (c) Movement of lands and subsidiary works.
- (d) Machine construction work.
- (e) Superstructure of the line.
- (f) Buildings, workshops, and complementary plants.
- (g) Telegraphs, signals, and apparatus for these services.
- (h) Installations for water supply.
- (i) Machinery and tools for the exploitation.
- (j) Equipment:
 - (a) Motor.
 - (b) For transportation of passengers.
 - (c) For transportation of freight.
 - (a) For transportation of company employees.

(2) The part of initial expenses enumerated between (a) and (i) shall be considered as the initial value of the railway, to which there is reference later on in the present decree.

(3) The concessionaire shall give an account to the Government of all later investment in complementary works which increase the initial value of the railroad.

ART. 7. The concessionaire shall be obliged to establish public service for transportation of passengers and freight.

The list or schedule of charges, time-tables, and rules relative to the exploitation of the railroad and its annexes shall be submitted for the approval of the President of the Republic, stipulated accordingly in decree No. 204 of May 28, 1915.

ART. 8. The concessionaire shall be obliged to permit the construction of roads penetrating to the stations or of branch roads proceeding from the lines to the object of this concession for the service of mines, industrial establishments, etc.

These emanating branch roads, or penetrating roads, or complementary installations, shall be established on account of the interested parties, having prior permission of the Government, and the concessionaire shall be obliged to accept cargo for or from these branches without charges for the interested parties other than the payment of additional rates which the tariffs establish for this service.

ART. 9. The concessionaire is obliged to allow the junction of his lines with those of other existing railroads, or which may be constructed in the future; to consent to agreements with the aforementioned railways for the interchange of traffic, which may allow, if it is in conformity with the rules, the passing of rolling stock of one company on the lines of the other; to establish transit service for the transportation of passengers and freight by means of tickets, of direct rates, and of combined itineraries; to apportion the elements of transportation and articles of consumption which it regulates, and at the rate which has been established by common consent, to the companies which shall accept that which is set forth in

article 31 of the law of the policing of railways, whenever it may be necessary in order to make genuine the right stipulated by said legal order; to permit the installations which the aforesaid companies may require at the station junctions for facilities of service under conditions agreed to beforehand.

ART. 10. Any difficulties that may be occasioned between the interested parties on questions relating to articles 8 and 9 shall be decided without further recourse by the President of the Republic (department of railways), except the cases noted in statement 2 of article 31 of the law of the policing of railways.

ART. 11. The concessionaire shall be obliged to allow the installation of the State telegraph lines within the territory reserved for the service of the railroad and likewise to provide in the stations which the Government may select adequate premises for the establishment of offices for telegraph and post-office services.

ART. 12. For the transportation of military troops, arms, and war supplies the lowest rates which prevail for this service, on the railways exploited by the state, shall be applied, reduced to 50 per cent according to the law of policing of railways.

A discount of 50 per cent shall be granted on the rates of transportation to Government employees who travel in Government service and of fiscal freight by order of the state.

ART. 13. The concession term shall be for 60 years, beginning from the date on which the railroad shall begin business. At the end of this term the railroad and its accessories, with all its installations and tools for development, shall become state property without other obligation for the latter than that which results from that which is resolved in article 16, and, further, the payment of the balance for the value of the complementary works, which is referred to in article 6, section 3, provided that the National Congress shall grant the funds for that purpose. In case that the National Congress does not authorize the immediate payment, the value involved shall be canceled by a proportionate share of the concession.

The value of the complementary installations shall be paid, computed according to the form established in article 14, whenever the concessionaire does not follow the development according to the franchise which is resolved in the following section.

If the concessionaire, or whoever represents his rights, should so desire, he may continue in charge of development for a second period up to 30 years, upon payment in such case to the state of an annual rental fee equal to 4 per cent of the initial value of the railroad which is referred to in section 2 of article 6, also a premium per kilometeric ton of freight carried, which shall be adjusted by common agreement between the state and the concessionaire.

The state shall invest the funds resulting from this additional premium in the construction and betterment of the roads communicating with the railway stations.

The right which the present article grants to the concessionaire lapses if agreement is not reached with respect to the amount of the premium.

ART. 14. The state may obtain the railway at any time after the first 10 years of the concession.

The price of acquisition shall be the initial value of the railway (sec. 2 art. 6) less 2.5 per cent for each year and fraction over six months that has elapsed since the first 10 years of the concession, and the value of the complementary installations (sec. 3 art. 6) which have been paid later with approval of the Government, less 5 per cent for each year and fraction above six months that has elapsed since the date of their installation.

ART. 15. In any event, the concessionaire is obliged to deliver in a good state of preservation, and without other obligations than those foreseen in the present decree, the lands, lines, buildings, workshops, sundry installations, furnishings, fixtures, and tools destined for the exploitation of the railroad.

During the last five years which precede the conclusion of the concession, or from the time when the President of the Republic resolves to solicit the necessary funds from Congress for the acquisition of the railway, the Government shall have the right to retain that part of the cash receipts of the exploitation which it deems necessary for the maintenance of the railway and its offices.

ART. 16. Upon the railroad passing to the property of the state, either by sale or by the expiration of the term of concession, the latter may acquire the rolling stock which it deems necessary for the exploitation, and the concessionaire shall be obliged to sell it under negotiation of three appraisers, who are engineers, one named by each side and the third by the president of the supreme court of justice.

The concessionaire shall be obliged to cede to the state, if the latter shall require it, materials for consumption and supplies on hand at that date at cost according to the invoices.

ART. 17. If through any circumstance the concessionaire does not wish to continue the exploitation of the railway, he should declare it to the supreme government in order that the latter may approve or not its acquisition.

In case of acquiring it the price shall be stipulated by mutual agreement, but not above the initial value (sec. 2 art. 6) less 2.5 per cent for as many complete years as have elapsed since the initial date of the term of concession (art. 13) plus the value of the complementary installations computed in the form set forth in article 14, section 2.

ART. 18. If the railway should cease its development for more than one year, the state shall have the right to acquire it for 50 per cent of its maximum value, estimated according to the rule established in the preceding article.

In such a case the state can take possession of the railway and its annexes, prior inventory being taken.

ART. 19. The concessionaire is obliged to create for the construction and exploitation of the railway, a Sociedad Chilena, administered independently of any other business of any kind. This sociedad shall substitute for the concessionaire in all the rights and obligations which are derived from the present decree, and without the prior authorization of the President of the Republic it can not cede the concession to a third party, neither by alienation, lease, liquidation, nor by any other act which would transfer the whole or partial development of the railway.

ART. 20. The capital of this corporation shall be divided into shares, paid in cash. Bonds can not be issued except when the social capital is established in its totality and only after at least two-thirds of this capital has been invested in the railway.

In no event shall the sum of the bonds exceed the amount of the social capital invested.

In order to insure the fulfillment of these conditions, no issue of bonds may be made without the prior permission of the President of the Republic.

ART. 21. The railroad under this concession is subject to the legal dispositions or regulations which have been prescribed, or which hereafter shall be prescribed, on the matter whenever they are not contrary to those stipulated in the present decree.

ART. 22. The concessionaire shall make a deposit of 6,000 pesos, in cash or in bonds, from the Caja de Credito Hipotecario to the order of the department of railways, as a guaranty of the fulfillment of his obligations imposed in the present decree. The interest of these bonds, which shall be renewed in case of their being redeemed, shall be given to the concessionaire.

The restitution of this guaranty shall be made as soon as the work has been completely terminated and the Government authorizes the development of the railway.

ART. 23. The whole concession shall lapse if any one of these obligations imposed in the present decree is not fulfilled, and the guaranty deposit, which is referred to in the preceding article, shall be confiscated for the fiscal benefit.

If the concessionaire should require greater terms than those fixed in articles 3, 4, and 5 of the present decree, he should solicit the corresponding extension from the President of the Republic.

The Government shall reserve the right to concede such extension of time when it deems it just and convenient, or to deny it when to the contrary.

If the Government agrees to extend the petitioned extension, it shall concede it without any obligation if the concessionaire has proved that the delay of the fulfillment of his obligations is not due to lack of activity or diligence on his part. Failing in this proof, the extension may be granted by means of placing in the Arcas Fiscales the deposit of guaranty demanded in article 22, or a part of this deposit which the Government may determine; the concessionaire shall refund the total amount of such guaranty if the Government so demands.

ART. 24. The director of the treasury is authorized, in representing the treasury and within a term of three months from date, to sign, with the concessionaire or with the legally authorized representatives of the concessionaire, the general contract, to which the present decree should be resolved, a deposit of the guaranty referred to in article 22 of this decree having been made.

An authorized copy of said general contract and a certificate of the corresponding deposit should be given to the department of railways,

Let it be recorded, communicated, published, and inserted in the Bulletin of the Laws and Decrees of the Government.

ALESSANDRI.
ROBINSON PAREDES.

DECREE: MAY, 1924

ARTICLE 1. Permission is granted, without interference of a third party, to Don Leon Meershon to construct and exploit a railroad which joins Puerto Montt with Puerto Toledo, situated at the confluence of the Rivers Maullin and Gomez, and with the site and village of Rio Frio situated to the north of the aforementioned Maullin River.

ART. 2. The gage of this railroad shall be 1 meter and its length approximately 55 kilometers, which shall be divided into five sections: The first from Puerto Montt to Lagunitas, about 9 kilometers; the second, from Lagunitas to Las Quemadas del Salto, about 13 kilometers; the third, from Las Quemadas del Salto to Rio Frio, about 15 kilometers; the fourth, from Rio Frio to El Gato, about 9 kilometers; and the fifth, from El Gato to Puerto Toledo, about 9 kilometers.

ART. 3. Definite plans and estimates of construction shall be submitted for the approval of the Government within the following dates: One year for the first section; two years for the second; three, four, and five years for the third, fourth, and fifth sections, respectively. The time shall be counted from the date of publication in the *Diario Oficial* of the present decree.

ART. 4. The work of construction of the railway for each section shall begin within six months after the approval of the plans, provided that the department shall have consented to the concession of the fiscal lands necessary for the railroad, and it shall be finished within three years beginning from the same date.

ART. 5. The concessionaire should present to the department of railways within six months after the date of approval of the definite plans proof of having obtained the right to the lands necessary for the line and its annexes.

If it shall be necessary to run through fiscal lands, the concessionaire should solicit from the secretary of the treasury within the same time the permission necessary for its occupation.

ART. 6. SECTION 1. The concessionaire shall present at the end of the construction a descriptive report of the work and amount of initial expenses, classifying the different sections under the following headings:

- (a) Expenditures for information, organization, and administration.
- (b) Expropriation or acquisition of lands.
- (c) Movement of lands and subsidiary works.
- (d) Machine construction work.
- (e) Superstructure of the line.
- (f) Buildings, workshops, and complementary plants.
- (g) Telegraphs, signals, and apparatus for these services.
- (h) Installations for water supply.
- (i) Machinery and tools for the exploitation.
- (j) Equipment:
 - (a) Motor.
 - (b) For transportation of passengers.
 - (c) For transportation of freight.
 - (d) For transportation of company employees.

SEC. 2. The part of initial expenses enumerated between (a) and (i) shall be considered as the initial value of the railway, to which there is reference further on in this decree.

SEC. 3. The concessionaire shall give an account to the Government of all later investments which increase the initial value of the railroad.

ART. 7. The concessionaire shall be obliged to establish public service for the transportation of passengers and freight.

The list or schedule of charges, time-tables, and rules relative to the exploitation of the railroad and its annexes shall be submitted for the approval of the President of the Republic, stipulated accordingly in decree No. 204 of May 28, 1915.

ART. 8. The concessionaire shall be obliged to permit the construction of roads penetrating to the stations or of branch roads proceeding from the lines to the object of this concession for the service of mines, industrial establishments, etc.

The emanating branch roads, or penetrating roads, or complementary installations, shall be established on account of the interested parties, prior permission from the Government having been secured, and the concessionaire shall be obliged to accept cargo for or from these branches without charges for the interested

parties other than the payment of additional rates which the tariffs establish for this service.

ART. 9. The concessionaire is obliged to allow the junction of his lines with those of other existing railroads or those which may be constructed in the future; to consent to agreements with the aforementioned railways for the interchange of traffic, which may allow, if it is in conformity with the rules, the passing of rolling stock of one company on the lines of the other; to establish transit service for the transportation of passengers and freight by means of tickets, of direct rates, and of combined itineraries; to apportion the elements of transportation and articles of consumption which it regulates and at the rate which has been established by common consent to the companies which shall accept that which is set forth in article 31 of the law for the policing of railways, whenever it may be necessary in order to make genuine the right stipulated by said legal order; to permit the installations which the aforesaid companies may require at the station junctions for facilities of service under conditions agreed to beforehand.

ART. 10. Any difficulties that may occur between the interested parties on questions relating to articles 8 and 9 shall be decided without further recourse by the President of the Republic (department of railways), except the cases noted in statement 2 of article 31 of the law of policing of railways.

ART. 11. The concessionaire shall be obliged to allow the installation of the state telegraph lines, within the territory reserved for the railroad, and likewise provide in the stations which the Government may select adequate premises for the establishment of offices for telegraph and post-office services.

ART. 12. For the transportation of military troops, arms, and war supplies the lowest rates which prevail for this service on the railways exploited by the State shall be applied, reduced to 50 per cent, according to the law of policing of railways.

A discount of 50 per cent shall be granted on the fares of transportation to Government employees who travel in Government service, and of fiscal freight by order of the State.

ART. 13. The concession term shall be for 60 years, beginning on the date when the railroad shall begin business. At the end of this term the railroad and its accessories, with all its installations and tools for development, shall become state property without other obligation for the latter than that which results from that which is resolved in article 16, and further the payment for the balance of the value of the complementary works, which is referred to in article 6, section 3, provided that the National Congress shall grant the funds for that purpose. In case that the National Congress does not authorize the immediate payment, the value involved shall be canceled by a proportionate share of the concession.

The value of the complementary installations shall be paid, computed according to the form established in article 14, whenever the concessionaire does not follow the development according to the franchise which is resolved in the following section.

If the concessionaire, or whoever represents his rights, should so desire, he may continue in charge of the development for a second period up to 30 years upon payment in such case to the state of an annual rental fee equal to 4 per cent of the initial value of the railroad, which is referred to in section 2 of article 6; also a premium per kilometric ton of freight carried, which shall be adjusted by common agreement between the state and the concessionaire.

The state shall invest the funds resulting from this additional premium in the construction and betterment of the roads communicating with the railway stations.

The right which the present article grants to the concessionaire lapses if agreement is not reached with respect to the amount of the premium.

ART. 14. The state may obtain the railway at any time after the first 10 years of the concession.

The price of acquisition shall be the initial value of the railway (sec. 2, art. 6) less 2.5 per cent for each year and fraction over six months that has elapsed since the first 10 years of the concession, and the value of the complementary installations (sec. 3, art. 6) which have been paid later with approval of the Government, less 6 per cent for each year and fraction over six months that has elapsed since the date of their installation.

ART. 15. In any event, the concessionaire is obliged to deliver in a good state of preservation, and without other obligations than those foreseen in the present decree, the lands, lines, buildings, workshops, sundry installations, furnishings, fixtures, and tools destined for the exploitation of the railroad.

During the last five years which precede the conclusion of the concession, or from the time when the President of the Republic resolves to solicit the necessary funds from Congress for the acquisition of the railway, the Government shall have the right to retain that part of the cash receipts of the exploitation which it deems necessary for the maintenance of the railway and its offices.

ART. 16. Upon the railroad passing to the property of the state, either by sale or by expiration of the term of concession, the latter may acquire the rolling stock which it deems necessary for the exploitation, and the concessionaire shall be obliged to sell it under negotiation of three appraisers, who are engineers, one named by each side and the third by the president of the supreme court of justice.

The concessionaire shall be obliged to cede to the state, if the latter shall require it, materials for consumption and supplies on hand at that date at cost according to the invoices.

ART. 17. If, through any circumstance, the concessionaire does not wish to continue the exploitation of the railway, he should declare it to the Supreme Government in order that the latter may approve or not its acquisition.

In case of acquiring it the price shall be stipulated by mutual agreement, but not above the initial value (sec. 2, art. 6), less 2.5 per cent for as many complete years as have elapsed since the initial date of the term of concession (art. 13), plus the value of the complementary installations computed in the form set forth in article 14, section 2.

ART. 18. If the railway should cease its development for more than one year, the state shall have the right to acquire it for 50 per cent of its maximum value, estimated according to the rule established in the preceding article. In such a case the state can take possession of the railway and its annexes, prior inventory being taken.

ART. 19. The concessionaire is obliged to create for the construction and exploitation of the railway, a Sociedad Chilena, administered independently of any other business of any kind. This sociedad shall substitute for the concessionaire in all the rights and obligations which are derived from the present decree, and without the prior authorization of the President of the Republic it can not cede the concession to a third party, neither by alienation, lease, liquidation, nor by any other act which would transfer the whole or partial development of the railway.

ART. 20. The capital of this corporation shall be divided into shares, paid for in cash. Bonds can not be issued except when the social capital is established in its totality and only after at least two-thirds of this capital has been invested in the railway.

In no event shall the sum of the bonds exceed the amount of the social capital invested.

In order to insure the fulfillment of these conditions, no issue of bonds may be made without the prior permission of the President of the Republic.

ART. 21. The railroad under this concession is subject to the legal dispositions or regulations which have been prescribed, or which hereafter shall be prescribed, on the matter whenever they are not contrary to those stipulated in the present decree.

ART. 22. The concessionaire shall make a deposit of 6,000 pesos, in cash or in bonds, from the Caja de Credito Hipotecario to the order of the department of railways as a guaranty of the fulfillment of his obligations imposed in the present decree. The interest on these bonds, which shall be renewed in case of their being redeemed, shall be given to the concessionaire.

The restitution of this guarantee shall be made as soon as the work has been completely terminated and the Government authorizes the development of the railway.

ART. 23. The whole concession shall lapse in itself, without necessity for the Government to declare it such, if any one of these obligations imposed in the present decree is not fulfilled and the guaranty deposit which is referred to in the preceding article shall be confiscated for fiscal benefit.

If the concessionaire should require greater terms than those fixed in articles 3, 4, and 5, of the present decree, he should solicit the corresponding extension from the President of the Republic.

The Government shall reserve the right to concede such extension of time when it deems it just and convenient or to deny it when to the contrary.

If the Government agrees to extend the petitioned extension, it shall concede it without any obligation if the concessionaire has proved that the delay of the fulfillment of his obligations is not due to lack of activity or diligence on his part. Failing in this proof, the extension may be granted by means of placing in the Arcas Fiscales the deposit of guaranty demanded in article 22, or a part of this

deposit which the Government may determine; the concessionaire shall refund the total amount of such guaranty if the Government so demands.

ART. 24. The director of the treasury is authorized, in representing the treasury, and within a term of three months from date, to sign, with the concessionaire or with the duly authorized representatives of the concessionaire, the general contract, to which the present decree should be resolved, a deposit of the guaranty referred to in article 22 of this decree having been made.

An authorized copy of said general contract and a certificate of the corresponding deposit should be given to the department of railways.

Let it be recorded, communicated, published, and inserted in the Bulletin of the Laws and Decrees of the Government.

PORT OF SAN ANTONIO TO LAS CABRAS RAILWAY

It has been proposed to construct a railway from the Port of San Antonio through an agricultural district to Las Cabras. This has met with determined opposition from Valparaiso interests, which will only agree to the construction of such a railway provided that authorization be granted for the construction of the Valparaiso to Santiago via Casa Blanca railway. The fear of these interests that the development of the Port of San Antonio would be a menace to the growth of Valparaiso is the reason for this determined opposition.

VALPARAISO TO SANTIAGO VIA CASA BLANCA RAILWAY

There has been considerable agitation for the construction by private capital of a railway from Valparaiso to Santiago via Casa Blanca. Up to 1927 there had been no concession granted providing for its construction.

SANTIAGO & TALAGANTE RAILWAY

On February 6, 1923, a decree was issued by the Chilean Government granting a concession to construct and operate an electric railway between Santiago and Talagante, a distance of 42 kilometers. Up to 1927 actual construction had not been inaugurated. A copy of this decree is as follows:

ARTICLE 1. Permission is hereby granted, as requested, without prejudice to others, to Ch. Kuster and Horacio Valdes, to construct and operate an electric railway between Santiago (corner of Union Americana and Delicias), and the principal plaza (square) of Talagante, passing through the streets Union Americana, Toesca, Esposicion, and the highway to Melipilla, with a branch from Santiago (corner of the Plaza Argentina and Borjas Street) to a junction with the principal line in the highway to Melipilla, traversing Borjas, Vicuna Mackenna, and Antonio Veras Streets; another branch to Maipu, and another between Malleco and Penaflor, through the highway which unites these two towns.

The crossing of the new railway with the lines of the State Railways will be effected by passing either over or under the latter.

ART. 2. The gage will be 1.435 and the approximate length of the principal line, with its branches, will be 42 kilometers.

ART. 3. Plans of the layout and works of the railway as well as of the electric plants will be submitted for approval of the Government within one year from the date of the present decree.

ART. 4. Concession is granted for a term of 10 years, counting from the date on which the railway is opened for public service, for the right to use the public highways for the line, stations, and other works which the President of the Republic may authorize.

ART. 5. The work of construction of the road must be commenced within two months and terminate within two years, both counting from the date of approval of the plans by the President.

ART. 6. Tariffs, itineraries, and rules and regulations for transportation of this railway will be submitted for approval of the Government in accordance with the terms of decree No. 204 of May 28, 1915.

ART. 7. In order to assure the carrying out of the terms of paragraph 2, of article 21 of the law "Policia de Ferrocarriles," the Government reserves the right to specify the number of vehicles which must be maintained in service at different hours of the day.

ART. 8. The concessionaires must be governed by the law of "Policia de Ferrocarriles" of August 6, 1862, law No. 1,665, of August 4, 1904, and the regulations of legal character which have been dictated or will be dictated in the future relative to such matters for traction, steam, or electric railways.

ART. 9. The concessionaires must make a deposit of 25,000 pesos in mortgage bonds as a guaranty for the carrying out of the obligations enumerated in the present decree.

The interest from these bonds will be collected by the concessionaires who will make substitutes for those which may become redeemable.

ART. 10. The Director of the Treasury is authorized to sign, within a period of two months from this date, in representation of the Government, with the concessionaires or their duly authorized representatives, the public deed into which the present decree must be converted.

POZO ALMONTE TO PICA RAILWAY

The proposed construction of this railway as authorized by decree No. 262 of May 1, 1923, giving permission to Alfred Mayas Nicholls for the construction of this railway, was canceled by decree No. 21 of October 24, 1924, because plans were not submitted within the period specified in the decree of concession. This project had not been revived up to December 31, 1927. A copy of this concession is as follows:

ARTICLE 1. Without prejudice to third parties there is granted to Alfredo Mayas Nicholls a permit to construct and operate a railway connecting Pozo Almonte and Pica with a branch from Cumunalla (Caschones to Pintados).

ART. 2. The gage of this railway shall be 1 meter and its length about 20 kilometers.

ART. 3. The final plans and estimates of the construction work shall be submitted for the approval of the Government within a period of six months beginning with the date of this decree.

In preparing these plans the railway shall be considered as a project of general interest as referred to in decree No. 477, dated March 15, 1907.

The construction regulations shall be those established in decree No. 396 of September 22, 1916, for second-class railways having a gage of 1 meter.

ART. 4. The construction work on each section of the railway must be begun six months after approval of the plans, provided the ministry has granted the concessionaire the use of Government lands needed for the line. Construction work must be completed within three years, beginning with the date of this decree.

ART. 5. Within six months after the date of the decree approving the final plans, the concessionaire must submit to the Ministry of Railways evidence that he has obtained ownership of the lands necessary for the line and its facilities.

If necessary to cross Government lands, the concessionaire must secure the required permit from the Ministry of Public Property, within the same period (six months) authorizing him to use these lands.

ART. 6. (1) Upon completion of the construction work the concessionaire must submit a report describing the works and detailing the various expenditures, classified under the headings shown below:

- (a) Expenditures for studies, organization, and administration.
- (b) Expropriations or acquisitions of land.
- (c) Moving dirt and secondary work.
- (d) Buildings.
- (e) Permanent way.
- (f) Buildings, shops, and supplementary installations.
- (g) Telegraph, signals, and apparatus for this service.
- (h) Water-supply equipment.
- (i) Material and tools for operation.

(j) Equipment:

- (a) Traction.
- (b) Passenger transportation.
- (c) Freight.
- (d) Work service for the railway.

(2) The part of the initial expenses included under letters (a) to (i) shall make up the initial value of the railway referred to later in this decree.

(3) The concessionaire must inform the Government of all subsequent investments for additional works increasing the initial value of the railway.

ART. 7. The concessionaire is obligated to establish public passenger and freight transportation service.

The rates, time-tables, and regulations relative to the operation of the railway and its facilities shall be submitted for approval to the President of the Republic in accordance with the stipulations of decree No. 204 of May 28, 1915.

ART. 8. The concessionaire is obligated to permit the construction of lines connecting with the stations or of branches starting from the line referred to in this concession for mine service, industrial concerns, etc.

The aforesaid connecting and branch lines and additional facilities shall be built at the expense of the interested parties, after securing a permit from the Government, and the concessionaire is obliged to receive freight in his equipment whether destined to or originating on these branches. The interested parties are obligated to pay only the additional charges provided in the rate schedule for such service.

ART. 9. The concessionaire is obliged to permit other railways, now in operation or to be constructed later, to connect with his line; to execute contracts with the said railways for traffic interchange so that rolling stock belonging to one line can use the tracks of the other; to establish connection service for passengers and freight by means of tickets, direct rates, and joint time-tables; to furnish the transportation equipment and the necessary material he possesses at the price arranged by joint agreement with the companies observing the provisions of article 31 of the Ley de Policia de Ferrocarriles to the extent necessary to make actual use of the right granted by the said law; to permit the said companies to install the facilities needed for the service at the connecting stations under the conditions established beforehand.

ART. 10. Controversies that may arise among the interested parties concerning matters referred to in articles 5 and 9 shall be settled, without further recourse, by the President of the Republic (Ministry of Railways), except in the cases covered by paragraph 2 of article 51 of the Ley de Policia de Ferrocarriles.

ART. 11. The concessionaire is obliged to permit the installation of Government telegraph lines on the tracts reserved for railway service; he must also furnish suitable places at the stations selected by the Government for establishing offices for the telegraph and mail service.

ART. 12. The transportation of military forces, arms, and war equipment shall be subject to the lowest rates charged for this service on railroads operated by the Government, with a 50 per cent reduction in conformity with the provisions in the Ley de Policia de Ferrocarriles.

There shall be a 50 per cent discount from the rates charged for the transportation of public employees while on duty and for the handling of Government freight for the account of the state.

ART. 13. The concession shall be valid for a period of 35 years, beginning with the date on which the railway is opened to traffic. At the end of that time the railway and its facilities, all its installations, operating equipment, tools, and buildings shall become Government property, without any charges except as specified in article 16, and the payment of the balance due on the cost of the additional works referred to in article 6, paragraph 3, provided the National Congress appropriates funds for this purpose. In case the National Congress does not authorize immediate payment, the cost referred to shall be adjusted in proportion to the period of duration of the concession.

The cost of the additional works shall be computed according to the form established in article 14, provided the concessionaire does not remain in charge of the operation in conformity with the privilege accorded him in the following paragraph:

If the concessionaire, or the authorized representative of his rights, so desires, he may continue to direct the operation of the line for a second period of as long as 30 years, in which case he shall pay the Government an annual rent equal to 4 per cent of the initial value of the railway according to paragraph 2 of article 6, in addition to a ton-kilometer premium for freight transported as fixed by agreement between the Government and the concessionaire.

The Government shall invest the funds derived from this additional premium in the construction and improvement of roads leading to the railway stations.

The right conferred by this article to the concessionaire lapses if no agreement is reached as to the amount of the premium.

ART. 14. The Government can purchase the railway at any time after the lapse of the first 10 years of the concession.

The purchase price shall be the initial value of the railroad. (Par. 2, art. 6.) The price shall be reduced 4 per cent by as many times as the number of full years or fractions of years of over six months elapsing after the first 10 years of validity of the concession and the cost of the additional works subsequently constructed with the approval of the Government shall be reduced 5 per cent as many times as the number of complete years and fractions of years of over six months that have elapsed since the date of their installation.

ART. 15. In all cases the concessionaire is obligated to deliver up in a good state of preservation, and with no other charges than those mentioned in this decree, all the lands, tracks, buildings, shops, miscellaneous installations, tools, and implements used in the operation of the railway.

During the last five years preceding the termination of the concession, or from the time in which the President of the Republic may decide to request from the Congress the funds necessary to buy the railway the Government shall have the right to retain the part of the operation receipts it deems necessary for use in the maintenance of the railway and its facilities.

ART. 16. If the Government decides to buy the railway, it may purchase only the rolling stock considered necessary for operation. The concessionaire is obligated to sell this material, having its value appraised by three experts who are engineers, one of them appointed by each party and the third by the president of the supreme court of justice.

If so required, the concessionaire is obliged to turn over to the Government all material in use and the extra parts on hand at that date at the invoice cost price.

ART. 17. If for any reason, the concessionaire desires to discontinue operation of the railway, the proper notice must be given to the supreme Government, so that the latter may decide whether it wishes to buy the line.

In case the railway is purchased, the price shall be stipulated by mutual agreement, but it must not exceed the initial value (par. 2, art. 2), reduced 2.5 per cent as many times as the number of complete years that have elapsed since the date of the beginning of the concession (art. 13); the value of the additional works shall be computed in the manner referred to in article 14, paragraph 2.

ART. 18. If the railway suspends operation for over one year, the Government shall have the right to buy it for 50 per cent of its maximum value, computed according to the rule established in the preceding article.

In this case the Government can take possession of the railway and its facilities before an inventory has been taken.

ART. 19. For the construction and operation of the railway the concessionaire is obligated to organize a Chilean company, administered independently of any other business of any kind.

This company shall represent the concessionaire in all the rights and obligations arising from this decree. Without the previous permission of the President of the Republic it may not transfer the concession to others, either by sale, lease, fusion, or by any other act which may transfer the operation of the railway in whole or in part.

ART. 20. The capital of the company shall be divided into shares payable in cash.

No bonds may be issued until the entire capital stock has been raised and after a two-thirds part at least of this capital has been invested in the railway.

The amount of the bonds must never exceed the total capital stock invested.

To assure the fulfillment of these provisions, no bonds may be issued without previously obtaining a permit from the President of the Republic.

ART. 21. The railway referred to herein is subject to all legal provisions or regulations now in force or that may be dictated on this matter at some future time, provided they do not conflict with the stipulations of this decree.

ART. 22. The concessionaire shall deposit 6,000 pesos, in cash or in bonds of the Caja de Credito Hipotecario, to the order of the Ministry of Railways, as a guaranty of the fulfillment of the obligations imposed by this decree.

The interest on these bonds, which shall be renewed in the event they are amortized, shall be collected by the concessionaire.

The guaranty shall be returned as soon as construction work is completed and the Government authorizes the operation of the railway.

ART. 23. Failure to fulfill any of the obligations imposed by this decree shall result in the cancellation of the entire concession, and the deposit referred to in the preceding article shall become Government property.

If the concessionaire requires longer periods than those fixed by articles 3, 4, and 5 of this decree, the corresponding extension must be duly requested from the President of the Republic.

The Government reserves the right to grant such extensions of time when deemed justified and convenient or to refuse them if so desired.

If the Government agrees to the extension requested, it shall be granted without any charges when the concessionaire proves that the delay in the fulfillment of his obligations is not due to any lack of activity or diligence on his part.

This extension can be granted only after the guaranty deposit referred to in article 320 or the portion of this deposit demanded by the Government has been returned to the treasury. The concessionaire is obliged to deposit the entire amount if so required by the Government.

ART. 24. Three months from this date the director of the treasury, as representative of his branch, is authorized to sign with the concessionaire or his legally appointed representatives the public document to be based on this decree, provided the deposit referred to in article 23 of this decree has been properly made.

A legalized copy of this public document and the corresponding certificate of deposit should be delivered to the Ministry of Railways.

Register, communicate, publish, and insert in the Bulletin of Laws and Decrees of the Government.

LONCOCHE-VILLARRICA RAILWAY

Under date of June 22, 1926, the Minister of Public Works presented to the Senate a bill for the construction of two railways, one of which was to run from Quino to Galvarino and the other from Loncoche to Villarrica, in accordance with plans and specifications to be submitted for the approval of the Minister of Public Works. This law reads as follows:

ARTICLE 1. The President of the Republic is authorized to contract for, either separately or jointly and by public bids, the construction of the Quino-Galvarino and Loncoche-Villarrica railways in sums not to exceed 8,242,200 pesos for the first named and 10,720,000 for the second, in accordance with plans and specifications which he may approve, after receiving reports from the bureau of public works and the public works council.

ART. 2. Payment for this work shall be made by annual allotments of 2,500,000 pesos for each railway from the general estimates of the nation for 1927, 1928, and 1929. Any unexpended balances shall be carried forward from one year to another. Such balances as may remain unpaid after crediting the before-mentioned amounts shall be paid in two equal yearly payments, plus 8 per cent interest from the date of the provisional delivery of each railroad.

Under date of May 18, 1928, the Minister of Railways of Chile called for certificates and antecedents for registration of all firms interested in the construction of the above-mentioned Loncoche to Villarrica Railway.

The contract to construct the Loncoche to Villarrica Railway was awarded to Manuel Mora, Avenida Santa Maria, 0420, Santiago, a local contractor, in September, 1928, who began work in November of the same year. The railway will be approximately 46 kilometers in length and will involve an expenditure of about 10,417,000 pesos.

OTHER PROPOSED RAILWAYS

Quino-Galvarino railway.—This is one of two railways construction of which was asked of the Senate by the Ministry of Public Works under date of June 22, 1926. The Senate bill is quoted in the chapter devoted to the Loncoche-Villarica railway.

In September, 1928, the contract for its construction was awarded to Ricardo Herrera, Augustinas 1148, Santiago, who submitted the low bid of 8,347,000 pesos. On October 31, 1928, the Government

approved the plans which were submitted by the railway department of the Ministry of Industry to expropriate lands through which this railway will be constructed and appointed a commission to assess the value of the property to be taken. The railway when completed will extend about 28.6 kilometers, and it is expected that it will be placed in operation within three years.

Cia. Chilena Alemana Holandesa Mineral de Algarrobal.—In January, 1927, this company (which is a German and Dutch group) endeavored to secure a concession to build a railway from Algarrobal to a point on the coast. The Government insisted that they construct a short railway line connecting Algarrobal with the State Railways at a point called Huasco. No action has yet been taken on this project. The railway, if built, would be 75 kilometers in length and involves the construction of a port and several tunnels. For further information regarding this project the company should be addressed at Algarrobal, Chile.

Los Almos to Curanilahue railway.—Preliminary plans have been drawn for the construction of a railway which would connect Curanilahue, one of the termini of the Ferrocarril Concepcion Arauco Curanilahue, with Alamos, a station on the Lebu to Los Sauces railway, which was taken over by the State Railways on May 1, 1928.

Valparaiso to Santiago via the Cuesta de Chacabuco railway.—During the latter part of 1928 the Minister of Public Works of Chile received a request from a Chilean engineer to permit the construction of a double-track railway connecting Valparaiso with Santiago via the Cuesta de Chacabuco. According to the petition, the line would be completed within four years and would be entirely independent of the existing railway.

Cocule to Lago Ranco railway.—In December, 1928, the Government awarded a contract to build a railway from Cocule to Lake Ranco, approximately 50 kilometers in length, to a firm of Chilean contractors, Barriga, Wachholtz, Alessandria y Cia., Galeria Alessandri 16, Santiago, Chile. According to the plans submitted by the contractors, the railway will cost 15,480,000 pesos and will be completed in four years.

San Clemente to Mariposa railway.—It is expected that a railway will be constructed shortly to connect San Clemente with Mariposa, a distance of 15.6 kilometers. Allocation of 452,000 pesos was included in the summary of proposed railway construction made by the Government in 1928.

Hualane to Constitucion railway.—It is understood that preliminary studies are now being completed for the construction of a railway to connect Hualane with Constitucion. Whether the Government will authorize the construction of this railway within the next few years is doubtful.

Corte Alto-Rio Frio railway.—It is understood that plans are now being prepared for the construction of this railway. The railway when completed will connect Corte Alto with Rio Frio.

Rio Bueno-Maullin railway.—It is understood that definite plans are under way to construct a railway running from Rio Bueno to Maullin, a distance of 110 kilometers. According to the information available, bids will be requested for its construction not later than October, 1929. It is estimated that it will cost about 26,000,000 pesos.

STREET RAILWAYS OF CHILE

In this section an effort is made to set forth the salient features of the electric and animal traction street railway systems of Chile. The text affords a discussion of the 10 leading electric street railway lines which operate approximately 352.2 kilometers, and five of the principal animal traction lines, operating 35.5 kilometers. According to the latest Government report available, which is for the calendar year 1925, the total capitalization of street railways in Chile amounted to 205,085,696 pesos, of which amount 2,257,956 pesos represented the investment of the animal traction companies. During the same period, approximately 184,297,402 street railway passengers were carried, of which number 178,741,694 passengers were carried by the electric lines.

There are very few cities in Chile which are large enough to support a modern street railway system and it is doubted whether street railways will ever be installed to the extent that they have been in older countries, in view of the development of modern bus transportation.

The following statement shows the leading electric and animal traction companies in Chile:

ELECTRIC STREET RAILWAY SYSTEMS

Compañía Chilena de Electricidad:

Santiago Tramway & Light Co., total length in operation, 162 kilometers.

Santiago to San Bernardo Electric Railway Co., total length in operation, 80 kilometers.

Compañía General de Electricidad Industrial:

Rancagua street railway system, 1.5 kilometers.

Chillan street railway system, 4.8 kilometers.

Talca street railway system, 4.8 kilometers.

Temuco street railway system, 5 kilometers.

Compañía de Electricidad de Valparaíso:

Valparaíso street railway system, 32.2 kilometers.

Vina del Mar street railway system, 16.9 kilometers.

Compañía Electricidad de Concepción: Concepción to Talcahuano street railway system, 30.6 kilometers.

Iquique Tramway Co., 14.4 kilometers.

ANIMAL TRACTION COMPANIES ¹

Compañía Urbana de Chillan, 8.8 kilometers.

Sociedad Ferrocarril Electrico de Villa Alegre, 7.2 kilometers.

Ferrocarril Urbano de Coquimbo, 1 kilometer.

Ferrocarril Urbano de San Felipe, 11.5 kilometers.

Ferrocarril Urbano de Quillota, 7 kilometers.

COMPAÑÍA CHILENA DE ELECTRICIDAD ²

The concession for this enterprise was originally owned by Parish & Co. (a British concern), which in 1899 turned it over to the Chilean Electric Railway & Light Co. (Ltd.), a German company and believed to have been a subsidiary of the Deutsch Überseisch Electricitäts

¹ See p. 263 for names and addresses of minor animal traction companies.

² The Electric Bond & Share Co. are negotiating for the purchase of a controlling interest in this company.

Gesellschaft. Electric street-car service was inaugurated during 1900, and in 1910 large extensions were made to the lines. The London office of the above company had on deposit with a local bank a large number of its shares of this enterprise. Shortly after the beginning of the European War the British Government sequestered these shares and appointed the British house of J. G. White & Co. (Ltd.), as agents and administrators of the property. Under the terms of the treaty of Versailles, the British Government was authorized to dispose of these sequestered shares and at a public auction S. Pearson & Sons (Ltd.) purchased them, and by so doing assumed additional heavy outstanding obligations. The number of shares, however, was insufficient to give them control of the company at that time, although subsequently their holdings were increased by acquisitions of shares outstanding, both in Spain and France, so that they now have entire control of this enterprise.

In the meantime a group of American and Chilean engineers organized a local company known as the *Compañía Nacional de Electricidad*, which was to supply power to Santiago from a hydroelectric station at Maitenes, 60 kilometers distant. Construction work was well advanced on this project when the Pearson interests acquired control of this company. Subsequently the two organizations merged and a Chilean company known as the *Compañía Chilena de Electricidad* was formed. This company now has a declared capital of £8,250,000, and £4,800,000 in 8 per cent debentures outstanding. It supplies the power requirements of the city of Santiago and the region lying between that city and Valparaiso, and also to the *Compañía de Tracción & Alumbrado de Santiago*. It sells power to the *Compañía Electricidad de Valparaiso*, the electrified section of the State Railways from Valparaiso to Llai-Llai to Santiago and Llai-Llai to Los Andes, also to the electrified Chilean section of the Transandine Railway, the Santiago-San Bernardo street railway (which it owns), and a certain amount to the *Compañía Industrial de Electricidad*, which is another electric power company operating in the region south of Santiago. According to its charter, the company receives no subvention from the Government, although on its part it does agree to operate a certain number of cars on its different lines and also to pay the city of Santiago 2½ per cent on the gross street railway revenues as well as the cost of 6 centimeters of paving on each side of its rails when new concrete paving is undertaken. It pays for the maintenance of the paving only when it is damaged through tram service.

SANTIAGO TRAMWAY & LIGHT CO.

In 1925 the *Compañía Chilena de Electricidad* organized a separate company, in accordance with the terms of the original concession owned by the parent company, to operate the street railways and supply light and power to the city of Santiago, under the name of the *Compañía de Tracción & Alumbrado de Santiago*. According to the organization plans, £2,000,000 of shares and £2,000,000 of debentures were issued. However, the company is entirely owned by the *Compañía Chilena de Electricidad* and these shares are not on the market. The subsidiary company owns the tramway lines in Santiago and leases the power distribution system in the district of Santiago from the parent company, supplying all light and power consumed in that district. During 1927 the company operated 162 kilometers of

track in Santiago and it is understood that it proposes to construct an additional 28 kilometers during the coming year.

Operating officials.—The operating officials of the company for the calendar year 1927 were as follows:

COMPAÑÍA CHILENA DE ELECTRICIDAD

General manager.—Harvey Diamond, Calle San Antonio esq. Santo Domingo, post office box Casilla 1557, Santiago, Chile.

Chief of production and distribution.—H. B. Wilkinson, Calle San Antonio esq. Santo Domingo, post office box Casilla 1557, Santiago, Chile.

Chief engineer.—H. G. Howard, Calle San Antonio esq. Santo Domingo, post office box Casilla 1557, Santiago, Chile.

Purchasing agent.—E. L. Lloyd, Calle San Antonio esq. Santo Domingo, Santiago, Chile.

COMPAÑÍA DE TRACCIÓN Y ALUMBRADO DE SANTIAGO

Manager, tramway department.—Horace Reed, Calle San Antonio esq. Santo Domingo, post office box Casilla 1557, Santiago, Chile.

Manager, light and power department.—Rene Pristo, Calle San Antonio esq. Santo Domingo, post office box Casilla 1557, Santiago, Chile.

General manager.—Harvey Diamond, Calle San Antonio esq. Santo Domingo, post office box Casilla 1557, Santiago, Chile.

Purchasing agent.—E. L. Lloyd, Calle San Antonio esq. Santo Domingo, post office box Casilla 1557, Santiago, Chile.

Purchases.—Purchases for both companies in England are made through the buying department of Whitehall Securities Corporation (Ltd.), 47 Parliament Street, London, S. W. 1, and in the United States through Carr Brothers (Inc.), 65 Broadway, New York City. Local purchases are made by E. L. Lloyd, purchasing agent, Calle San Antonio esq. Santo Domingo, Santiago, Chile. All purchases made in this manner, however, must be approved by the general manager and chief engineer, who actually consider and pass on all regulations and proposals.

Finances.—The company is controlled by the Whitehall Electric Investment (Ltd.), of England, which holds about 80 per cent of the ordinary share capital of £6,000,000, about 68 per cent of the preference share capital of £2,250,000 (8 per cent now cumulative participating), and about 76 per cent of the £4,800,000 first-mortgage bonds (8 per cent).

The balance sheet and profit and loss statement of the parent company for the fiscal year ended June 30, 1926, are shown in the following statements:

BALANCE SHEET OF THE COMPAÑÍA CHILENA DE ELECTRICIDAD, FISCAL YEAR ENDED JUNE 30, 1926

	LIABILITIES					
Authorized capital:	£	s.	d.	£	s.	d.
£2,250,000 preferred shares of £1 each, with right to dividend not cumulative of the 8 per cent with participation-----	2, 250, 000	0	0			
£6,000,000 common shares of £1 each issued-----	6, 000, 000	0	0			
				8, 250, 000	0	0
First 8 per cent mortgage bonds, being part of an authorized £5,000,000 issue-----				4, 600, 000	0	0
Accumulated interest on bonds-----				122, 666	13	4
Creditors and balances due-----				550, 542	8	8

Depreciation reserve, including that of the Santiago Traction & Light Co.....	£	s.	d.
Compulsory reserve.....	415,000	0	0
Profit and loss: Profit during year ended June 30, 1926.....	£	s.	d.
Less provisional dividend of 4 per cent preferred shares.....	187,423	0	2
	90,000	0	0
	97,423	0	2
	14,077,769	19	1
ASSETS			
Cost of the concern and property.....	£	s.	d.
Investments in and advances to the Santiago Traction & Light Co.:			
In shares.....	2,000,000	0	0
In bonds.....	2,000,000	0	0
Advances.....	197,983	9	10
Investments in and advances to other companies.....	4,197,983	9	10
Materials in warehouses and others on way to warehouse..	228,890	14	7
Santiago Traction & Light Co.:	416,693	7	1
Rents and interest not paid.....	222,194	15	2
Debtors and balances receivable.....	202,415	12	6
Cash on hand and remittances in transit.....	150,668	15	10
	14,077,769	19	1

PROFIT AND LOSS STATEMENT OF THE COMPAÑIA CHILENA DE ELECTRICIDAD FOR THE FISCAL YEAR ENDED JUNE 30, 1926

PROFIT			
	£	s.	d.
Rent of plants.....	78,996	4	1
Interest on first-mortgage bonds.....	363,333	6	8
Amount transferred to depreciation reserve, including reserve belonging to Santiago Traction & Light Co.....	80,000	0	0
Amount transferred to compulsory reserve.....	9,864	7	4
Balance transferred to general balance sheet.....	187,423	0	2
	719,616	18	3
LOSS			
	£	s.	d.
Net revenues of operation, expenses paid....	392,562	6	4
Received from Santiago Traction & Light Co., on account of rent on property.....	315,687	11	6
	708,249	17	10
Interest and discounts.....	11,367	0	5
	719,616	18	3

Traffic.—During the fiscal year ended June 30, 1925, the Santiago Street Railway Co. carried approximately 140,000,000 passengers. No freight of any kind is handled.

RIGHT-OF-WAY CHARACTERISTICS

The following details pertain to the Santiago tramways only.

Gage.—The system is of 1.435-meter gage throughout.

Curves.—The sharpest curve of the system has a center radius of 14 meters.

Ballast.—Crushed stone is used for ballast.

Ties.—The ties used are mostly of roble pelling, 25 by 20 centimeters by 2.10 meters, spaced on 0.75-centimeter centers.

Rails.—The rails used are of the British Lorrain Steel Co. type and are in three weights, namely, 70 pounds (tees), 107 pounds (groove), and 117 pounds (guard rail). These rails are all in sections 13½ meters long.

Maintenance.—The system is kept in very good condition and is sufficient to carry all traffic which is required.

Bridges.—There are four bridges over which the lines of this system operate. All of the bridges are the property of the city of Santiago.

Motive power and rolling stock.—The motive power and rolling stock owned by the company on December 31, 1927, consisted of: 334 wooden passenger cars, mostly of 1 truck arrangement, and equipped with hand brakes; 30 new steel cars of American manufacture, with two trucks, air brakes, and closed doors on the platforms; 130 wooden trailers for passenger service, all of the single-truck type; and 20 wooden maintenance cars, equipped with hand brakes. In March, 1928, a contract, signed by the company and municipality of Santiago, provided for the improvement of service by the addition of 40 new



FIGURE 49.—Electric car of Compañía de Electricidad y Industrial and animal traction car of the Compañía Urbano de Chillan at Chillan

2-truck cars. An effort was to be made to place 20 of these cars in service during 1928 and the remaining 20 during 1929. The company is also considering the installation of 100 40-horsepower motors on cars now in use and if this is done, it may be necessary to scrap a large number of seats with the consequential effect of being forced to purchase additional equipment.

Repair shops.—There is one repair shop located at Santiago. It is divided into a foundry, carpenter shop, electrical shop, paint shop, warehouse, etc. When working to capacity it employs approximately 500 men. It is well equipped with up-to-date machinery of both British and American manufacture and includes American woodworking machinery, a Morgan electric furnace, electric riveters, tire heaters, lathes, braiding machines, welders, coil-forming machines, etc.

SANTIAGO TO SAN BERNARDO ELECTRIC RAILWAY CO.

This company is owned by the Compañía Chilena de Electricidad, although its management and operation is entirely separate from the Santiago and Valparaiso street railway systems. During the calendar year 1927, the company had 80 kilometers of track in operation extending from the city of Santiago to the central part of the town of San Bernardo. The line, which operates as a passenger carrier only, transported approximately 2,950,000 passengers during 1926. Of this number, 55 per cent were first-class passengers.

Finances.—The balance sheet and profit and loss statement for the fiscal year ended June 30, 1926, were as follows:

BALANCE SHEET OF THE ELECTRIC RAILROAD FROM SANTIAGO TO SAN BERNARDO
FOR THE FISCAL YEAR ENDED JUNE 30, 1926

LIABILITIES		Pesos
Capital.....		4, 000, 000. 00
		Pesos
Accounts payable.....	241, 259. 09	
Savings and retirement fund.....	1, 539. 58	
Santiago to San Bernardo Electric Rail Road, 9 per cent first mortgage bonds.....	1, 355, 000. 00	
Mortgage bank of Chile.....	170, 266. 94	
Bank of Chile.....	7, 684. 18	
Dividends on shares.....	2, 560. 85	
Consumers' guaranty.....	17, 155. 45	
Reserve fund.....	220, 732. 26	
Construction fund.....	41, 177. 21	
Depreciation fund for material and equipment.....	160, 383. 73	
Personnel insurance fund.....	26, 548. 57	
Personnel pension and retirement fund.....	17, 459. 42	
Personnel guaranty.....	21, 083. 90	
Unforeseen.....	73, 647. 64	
		2, 356, 498. 82
Profit and loss.....		274, 421. 14
		<u>6, 630, 919. 96</u>

ASSETS		
Capital invested.....	5, 690, 423. 82	
Renewals.....	123, 703. 33	
Cash.....	5, 000. 00	
San Bernardo savings account.....	19, 697. 58	
Materials.....	427, 834. 30	
Accounts receivable.....	298, 185. 61	
Bonds and shares.....	19, 291. 45	
Advances.....	14, 379. 51	
Pending operations.....	16, 858. 68	
Chilean Electric Co. (Ltd.).....	15, 545. 68	
		6, 630, 919. 96
		<u>6, 630, 919. 96</u>

PROFIT AND LOSS STATEMENT OF THE ELECTRIC RAILROAD FROM SANTIAGO TO
SAN BERNARDO FOR THE FISCAL YEAR ENDED JUNE 30, 1926

LIABILITIES		Pesos
Street-car operation.....	1, 226, 383. 63	
Lighting operation.....	718, 590. 24	
Interests, rents, discounts.....	30, 862. 60	
Interest, rents, discounts on hand.....	46, 950. 00	
Accountants, auditors.....	7, 500. 00	

	Pesos	Pesos
Accounts due and depreciated.....	6, 350. 15	
Wear and tear of equipment (furniture, tools, etc.)..	7, 966. 94	
Pending operations (advances).....	152. 00	
	<hr/>	2, 044, 755. 56
Net profit.....		274, 421. 14
		<hr/>
		2, 319, 176. 70
ASSETS		
Traffic.....	1, 275, 998. 45	
Electric power sale.....	872, 452. 44	
Lease of electric plant.....	160, 000. 00	
Equipment, paid for in cash.....	10, 725. 81	
	<hr/>	2, 319, 176. 70
		<hr/>
		2, 319, 176. 70

Operating officials and purchases.—Minor purchases for the system are made through the office of the manager, Horacion Valdes, O., Calle Monedo 1020, Santiago. Large foreign purchases are usually contracted through the purchasing agents of the Cia. Chilena de Electricidad. (See p. 241.)

Right of way.—The line is of 1.435-meter gage, rails, for the most part, weigh 70 and 107 pounds to the yard, in sections of 8 and 10 meters. Ties of Chilean roble pelling 15 centimeters by 2.40 meters in length spaced on 6-centimeter centers, are used. In the cities the roadbed is paved, while outside it is ballasted with crushed stone.

Rolling stock and motive power.—During 1927, the line operated 17 cars, all of which were the 2-truck type and equipped with air-brakes. Fifteen of these cars are wood of the single-deck type, while two are of steel and have two decks. In addition there were two flat cars which are used to carry material for making repairs along the line.

Repair shops.—The company operates one small repair shop which is equipped with an electric furnace, electrically driven lathes, forming machines, drills, riveters, and welders.

COMPAÑÍA GENERAL DE ELECTRICIDAD INDUSTRIAL

The Compañía General de Electricidad Industrial is a Chilean corporation with its main offices in Santiago. Next to the Compania Chilena de Electricidad it is the largest electric company in Chile and serves the regions south of Santiago and Valparaiso. The company operates electric street railway systems in the towns of Rancagua, Chillan, Talca, and Temuco. All of these street railways are managed directly by the company from its head office in Santiago.

Operating officials.—The directors and operating officials of the company for the calendar year ended December 31, 1926, were as follows:

President.—Francisco Huneeus, Calle Bandera 60, Santiago, Chile.

Vice president.—Pedro E. Moller, Calle Bandera 60, Santiago, Chile.

Director general.—Raul Claro Solar, Calle Bandera 60, Santiago, Chile.

Directors.—Guillermo Amunatagui, Carlos Balmaceda, Luis Claro Solar, Carlos Johnson, and Oscar Urzua, Calle Bandera 60, Santiago, Chile.

Purchases.—Purchases for the four street railway systems are made by Raul Claro Solar, the director general of the company, who is located at Calle Bandera 60, Santiago, Chile.

Finances.—Separate financial information for each of these street railway systems is not available, although a combined statement of the balance sheet and profit and loss accounts for the calendar year ended December 31, 1926, are as follows. These statements include the operation of the four street railways as well as the other business of the company.

BALANCE SHEET OF THE GENERAL INDUSTRIAL ELECTRIC CO. AS OF DECEMBER 31, 1926

LIABILITIES		Pesos	Pesos
Capital.....	15,000,000.00		
Reserve fund.....	1,060,000.00		
Future dividend fund.....	45,000.00		
Depreciation and amortization.....	263,700.16		
Insurance fund.....	100,000.00		
Eventualities fund.....	11,777.54		
Dividends payable.....	31,239.96		
Due to shareholders.....			16,511,717.66
Banco Anglo Sud Am. Ltda.....	1,076,609.93		
Banco Anglo Sud Am. Ltda. coupon No. 2.....	13.50		
Accounts payable.....	248,223.67		
Siemens Schuckert Ltda.....	62,809.92		
General material account (increase in the debt in gold).....	8,288.00		
Papers payable.....	23,945.50		
Mortgage bonds.....	12,898,828.02		
Coupon No. 1.....	8,787.00		
Coupon No. 2.....	26,305.22		
Coupon No. 3.....	512,174.52		
Life insurance.....	178.45		
Tax on rent (income, revenue).....	303.74		
Pay books.....	2,926.66		
			14,869,394.13
Due to public.....			31,381,111.79
Loss and profit (net profit in second semester 1926).....			885,054.27
			32,266,166.06

ASSETS

Fixed capital

	Pesos
Value of establishments at Buin, Rancagua, Caupolicán, San Fernando, Chillán, Concepción, and Temuco.....	27,480,186.04

Circulating capital, general administration

	Pesos
Shares.....	1,797,543.00
Banco de Chile, Santiago.....	11,892.32
Banco de Chile, accounts, dividends.....	6,357.21
Banco de Chile, Rancagua.....	43.76
Banco de Chile, Rengo.....	432.28
Banco de Chile, San Fernando.....	1,721.71
Banco de Chile, Chillán No. 1.....	4,173.90
Banco de Chile, Chillán No. 2.....	445.85
Banco de Chile, Concepción.....	110.95
Banco de Chile, Temuco No. 1.....	294.79
Banco de Chile, Temuco No. 2.....	5,944.21
Banco Espanol de Chile, Santiago.....	186.50
Banco Frances e Ital. Cta. coupon No. 1.....	8,787.00
Banco Anglo Sud Am. Ltda. Cta.....	939.60
Banco Anglo Sud Am. Ltda. Concepción.....	173.18
Savings fund.....	470.42

	Pesos	Pesos
National savings fund.....	1, 120. 75	
Central office fund.....	789. 98	
Investigations and concessions.....	79, 161. 17	
Accounts due central office.....	3, 729. 75	
Furniture and fixtures.....	10, 484. 06	
Debts due.....	5, 040. 00	
Pending operations.....	185, 670. 11	
		2, 126, 512. 50

Accounts of the establishments

In treasury.....	51, 499. 80	
Receipts due.....	1, 207, 326. 65	
Accounts receivable.....	37, 884. 93	
Warehouses.....	1, 362, 756. 14	
		2, 659, 467. 52
		32, 266, 166. 06

PROFIT AND LOSS ACCOUNT OF THE GENERAL INDUSTRIAL ELECTRIC CO. AS OF
DECEMBER 31, 1926

LIABILITIES		Pesos	Pesos
Operation expenses and administration of the es- tablishments.....		1, 086, 755. 14	
Central office expenses.....		265, 643. 44	
Taxes, commissions and duties.....		47, 119. 02	
Depreciation and amortization.....		98, 339. 36	
Interest on mortgage bonds.....		512, 174. 52	
			2, 010, 031. 48
Net profit (second semester, 1926).....			885, 054. 27
			2, 895, 085. 75
ASSETS			
Revenues of the establishment.....		2, 796, 661. 72	
Interest and commissions.....		98, 424. 03	
			2, 895, 085. 75

RAUL CLARO SOLAR, *General Manager.*
RAMON CARRASCO CO., *Bookkeeper.*

This day we have examined the present balance sheet and have found it to agree with the balances as shown by ledger.

LUIS CASAVUEVA,
ARTURO IRARRAZAVAL,
Inspectors of accounts.

SANTIAGO, March 17, 1927.

In the following pages will be found a description of the four street railway systems operated by this company and located in Rancagua, Chillan, Talca, and Temuco.

RANCAGUA STREET RAILWAY SYSTEM

This street railway system, constructed during the years 1917 and 1918, was opened to traffic in 1919. The Compañía General de Electricidad Industrial obtained control of the enterprise during 1925.

In 1927, the system consisted of a single-track line running from the street railway station in Rancagua to a small plaza at the end of the town known as the Alemada, a distance of 1.50 kilometers. No extension of this trackage is contemplated at the present time. During 1926 the system carried approximately 850,000 passengers. No freight is carried.

Right of way.—The railway is of 1.435-meter gage, and has ties of roble pellin 19 by 13 centimeters by 2.10 meters, spaced on 80-centimeter centers on which tee tyne steel rails, as shown in the accompanying sketch, are placed. Sand and stone obtained locally are used for ballast. There is cobblestone paving between the rail and extending to about 50 centimeters from the outside rail. The line runs on practically a level stretch, there being no grades of any importance. The company operates a small repair shop which employs five men, although they are often used as a track gang in welding rail joints on the streets. The shop is equipped with one lathe and one upright drill and forge which are driven by electric power, and one hand shaper which is turned by hand.

CHILLAN STREET RAILWAY SYSTEM

This street railway company has been operating 4.8 kilometers of electric street railway track in Chillan since 1921. The company transports passengers only and during 1926 carried approximately 1,115,000 persons.



FIGURE 50.—Repair shop of the Compañía General de Electricidad y Industrial at Chillan

Purchases.—Purchases for the line are made by Raul Claro Solar, director general of the parent company, who is located at Calle Bandera 60, Santiago, Chile. The company is located at Calle Dieciocho 526, Chillan, Chile.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the line is 1.435 meters.

Grades.—Grades are slight. The entire line is practically on level ground.

Curves.—The minimum curve radius is 16 meters.

Ballast.—Earth and sand are used for ballast.

Rails.—Rails weighing 27 pounds to the yard, in sections of $21\frac{1}{2}$ to 22 feet, are used.

Ties.—Ties of roble pellin, 6 feet 10 inches by 10 inches by 5 inches, spaced on 25-inch centers, are used.

Maintenance.—The line is well maintained and is able to stand the traffic which is required of it. The company has agreed with the municipality to maintain paving on all streets that its lines traverse, for a distance of 50 centimeters on each side of the track, and also to recondition any paving which may be destroyed as a direct result of car service.

Rolling stock.—During 1927 the company operated seven single-deck, double-truck cars, and four trailers. Four of these cars carry 28 passengers each and three carry 20 passengers. They are all equipped with hand brakes.

Couplers.—Link and pin couplers, 50 centimeters from the ground to the center of the pin, are used.

Repair shops.—There is one repair shop located at Chillan, which employs six men. The shop is equipped with a lathe, repair well, drill, and welders, all of which are electrically driven.

TALCA STREET RAILWAY SYSTEM

This electric street railway system was opened to traffic in 1921 and was acquired by the Compañía General de Electricidad Industrial in January, 1927. At the present time it operates 4.80 kilometers of track and has plans for an extension of an additional 4 kilometers. During the year 1926, the system transported approximately 1,250,000 passengers. No freight is carried.

Purchases.—Purchases for this street railway system are made by Raul Claro Solar, the director general of the parent company, who is located at Calle Bandera 60, Santiago, Chile. The company is located at Calle 5 Oriente 2 y 3 Norte, Talca, Chile.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The system is of 1.435-meter gage throughout.

Curves.—The radius of the smallest curve on the line is 19 meters.

Ballast.—Earth and sand are used for ballast.

Ties.—Ties made of Chilean oak, 6 feet 10 inches by 10 by 5 inches, spaced on 25-inch centers, are used.

Rails.—There are two types of rails used on this system. One is the "Tee" type weighing 36 kilograms per meter and the other a groove type weighing 48.1 kilograms per meter. Both types are in 22-foot sections.

Rolling stock.—During the year 1927, the company operated eight wooden passenger cars, each divided by a partition and having a total seating capacity of 40 persons. The cars all have two trucks, of single-deck type, and are equipped with hand brakes and German controllers.

Couplers.—Link and pin couplers, 57 centimeters from the ground to the center of the pin, are used.

Repair shops.—The company operates one repair shop located at Talca, which when working to capacity employs six men. The shop is equipped with a lathe, repair well, drill, and welders.

TEMUCO STREET RAILWAY SYSTEM

This electric street-railway system was opened to traffic in 1919 and at the present time it has a total of 5 kilometers of track in operation. There are three distinct lines all of which have their main terminal at the central station. The company does not propose to increase its present kilometerage in the near future. During the year 1926, the line carried approximately 1,300,000 passengers. No freight is carried.

Purchases.—Purchases for the system are made by Raul Claro Solar, director general of the parent company, who is located at Calle Bandera 60, Santiago, Chile. The company is located at Calle D. Portales 875, Temuco, Chile.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the system is 1.435 meters.

Grades.—The system runs on practically a level stretch and has no difficult grades.

Curves.—The radius of the minimum curve on the system is 16 meters.

Ballast.—Two of the lines are paved between rails and for a distance of approximately 50 centimeters on each side, while the other is ballasted with crushed stone and sand.

Ties.—Ties of roble pellin, secured in southern Chile, 5 feet 8 inches by 3 by 5 inches, spaced on 25-inch centers, are used.

Rails.—Rails weighing 27 pounds to the yard, in sections of 21½ to 22 feet, are used.

Rolling stock.—During 1927, the company had in operation four single-deck, double-truck cars; four double-truck trailers; and three cars with single truck and deck.



FIGURE 51.—Type of car used by the Compañía General de Electricidad y Industrial at Temuco and Chillan

Couplers.—Couplers are of link and pin type and approximately 50 centimeters from the ground to the center of the pin.

Repair shop.—There is one small repair shop located at Temuco. This shop employs six men and is equipped with a lathe, repair well, drill, and welders.

COMPAÑÍA DE ELECTRICIDAD DE VALPARAISO

VALPARAISO AND VINA DEL MAR STREET RAILWAY SYSTEM

A street railway system was first inaugurated in Valparaiso in 1904 under the auspices of Saavedra Benard & Cia, a Valparaiso firm of German origin, established in 1886. The system was operated by the above firm until 1906 when its control was obtained by the Compañía de Tranvías Electricos de Valparaiso, a German company. The street railway lines, which at that time were confined to the city of Valparaiso, were extended to Vina del Mar, and other improvements were made. In spite of this, however, the company experienced con-

siderable financial difficulty. During the year 1920, much of its rolling stock was damaged or destroyed by "mobs," when due to the depreciation of the value of the Chilean peso the company endeavored to increase passenger rates in accordance with provisions written into its concession which expires in 1933.

Under date of April 11, 1923, the above company relinquished its control to S. Pearson & Sons (Ltd.), a British company, which established the present Compañía de Electricidad de Valparaíso. This company was incorporated under Chilean law with an authorized capital of £2,000,000, all of the capital stock of which is privately owned. In addition to the operation of the tramway system, the company supplies electricity to Valparaíso for light and power purposes. However, the capacity of its plant is so limited that it is forced to purchase additional power from the Compañía Refinería de Azúcar de Vina del Mar for the operation of its lines in that section, and also from the Compañía Chilena de Electricidad of Santiago. The company receives no governmental guaranty or subvention and is subjected to all existing taxes inclusive of income tax, kilometrage tax, maintenance of pavements, and the various taxes resulting from the social laws now in force. Recently it has been faced with competition from motor-bus companies which have already cut into its operating revenues.

For the calendar year ended December 31, 1927, the company had 32.2 kilometers of track in operation in the city of Valparaíso and 16.9 kilometers in the Vina del Mar section. No plans are being considered at the present time for any additional extension.

Operating officials.—The operating officials of the company, for the calendar year 1927 were as follows:

President.—Hon. Clive Pearson, 1111 Blanco Street, Valparaíso, Chile.

Director General.—A. E. Worswick, 1111 Blanco Street, Valparaíso, Chile.

General Manager.—A. P. Colquhoun, 1111 Blanco Street, Valparaíso, Chile.

Chief engineer.—F. W. Armstrong, 1111 Blanco Street, Valparaíso, Chile.

Chief accountant.—P. F. Cornochan, 1111 Blanco Street, Valparaíso, Chile.

Purchases.—Purchases are made in England through the buying department of the Whitehall Securities Corporation (Ltd.), 47 Parliament Street, London, S. W. 1, and in the United States through Carr Brothers (Inc.), 65 Broadway, New York City. Local purchases are made through the company's own organization. All purchases made in this manner, however, must be approved by the general manager and chief engineer who actually consider and pass on all requisitions and proposals.

Finances.—There is no financial information available relating entirely to the operation of the street railway system. The following statements pertain to all operations of the Compañía de Electricidad de Valparaíso and indicate its assets and liabilities as well as its profit and loss account for the fiscal year ended June 30, 1926.

BALANCE SHEET FOR YEAR ENDED JUNE 30, 1926

ASSETS

	£	s.	d.
Cost of business and properties on January 1, 1922, plus investments and repairs to date.....	2, 771, 998	19	11
Materials in stock and en route.....	92, 688	15	7
Accounts receivable, investments, and credit balances.....	211, 173	1	10
Cash on hand and in bank.....	94, 062	12	5
	3, 169, 923	9	9

LIABILITIES

Authorized capital:			
1,000,000 preferred shares of £1 each, with right to non-accumulative dividend of 8 per cent and participation	£	s.	d.
1,000,000 shares of common stock of £1 each	1,000,000	0	0
Mortgage bonds: 1,000,000 bonds of £1 each, paying 7 per cent interest	1,000,000	0	0
Reserve for depreciations (castigos)	78,159	10	8
Accounts payable and debit balances	49,782	0	5
Income tax	2,284	7	2
Obligatory reserve	7,066	0	0
Profit and loss:	£	s.	d.
Profit for year ended June 30, 1926	52,631	11	6
Less provisional dividend paid	20,000	0	0
	32,631	11	6
	3,169,923	9	9

PROFIT-AND-LOSS ACCOUNT FOR YEAR ENDED JUNE 30, 1926

PROFIT

Net receipts from operation (after deducting all expenses with the exception of income tax)	£	s.	d.
Interest and incomes	141,313	0	0
Differences in exchange	14,460	3	0
	2,374	4	9
	158,147	7	9

LOSS

Interest on bonds	£	s.	d.
Income tax	70,000	0	0
Fees of directors	4,708	13	5
Depreciation on equipment	2,500	0	0
Amount transferred to reserve for depreciation	6,400	0	0
Miscellaneous expenses	17,186	10	2
Balance transferred to general balance	4,720	12	8
	52,631	11	6
	158,147	7	9

Traffic.—The street railways do not transport freight although certain private industrials own electric street cars which are used over the lines of the traction company on payment of a stipulated fee. During the fiscal year ended June 30, 1926, a total of 41,256,076 passengers were transported. Of this number, 19,965,394 first-class passengers and 13,866,638 second-class passengers were carried over the Valparaíso section. On the Vina del Mar section during the same period 3,059,953 first-class passengers and 4,364,091 second-class passengers were transported.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—Both lines are of 1.435-meter gage throughout.

Grades.—The maximum grade on the system is 8 per cent. The grades, where they exist, are for short distances only.

Curves.—The radius of the minimum curve on the system is 15 meters.

Ballast.—Broken stone and dirt are used for ballast, although some of the lines are entirely ballasted with stone.

Ties.—Ties of Chilean wood 6 by 8 inches and from 7 to 8 feet in length, spaced on 0.7 and 1 meter centers, are used.

Rails.—Rails weighing 29, 31, 43, and 49 kilograms to the meter in 10, 12, 15, and 18 meter sections are used.

Maintenance.—The tracks of the system are well kept and the lines are at all times able to stand the traffic required. The company paid for and maintains the pavement between the tracks and for a distance of one-half meter on each

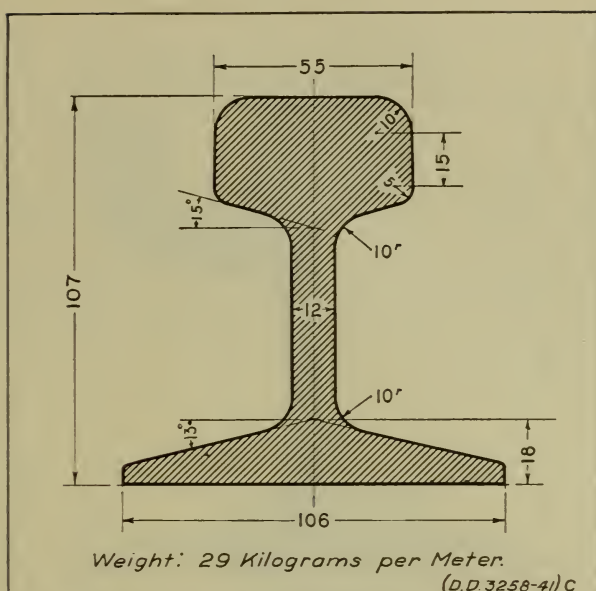


FIGURE 52.—Profile of 29-kilogram rail, Valparaiso tramway

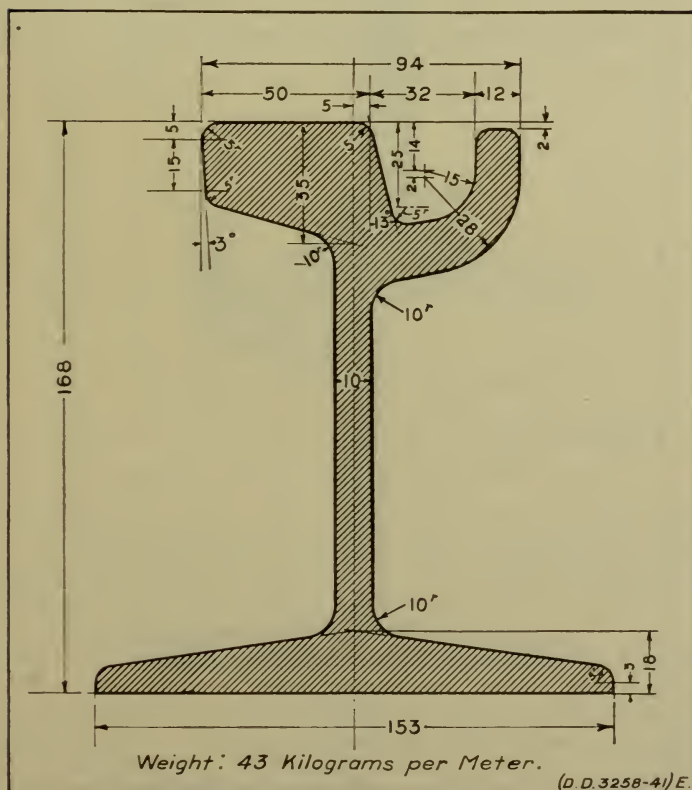


FIGURE 53.—Profile of 43-kilogram rail, Valparaiso tramway

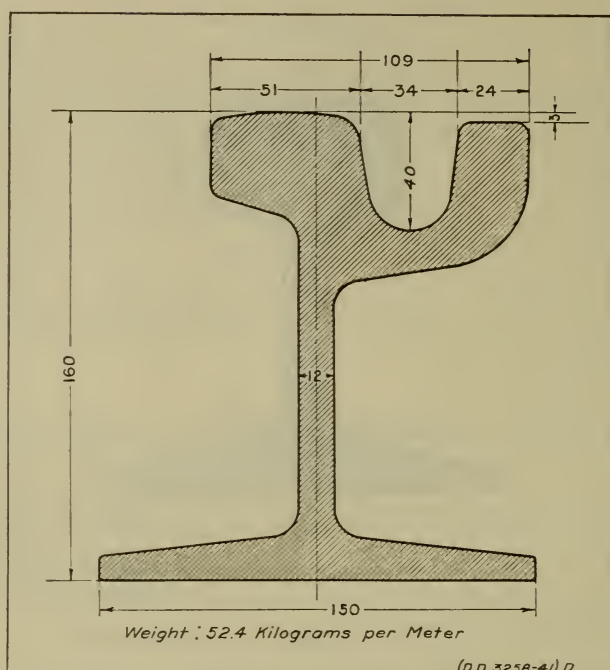


FIGURE 54.—Profile of 52.4-kilogram rail, Valparaiso tramway

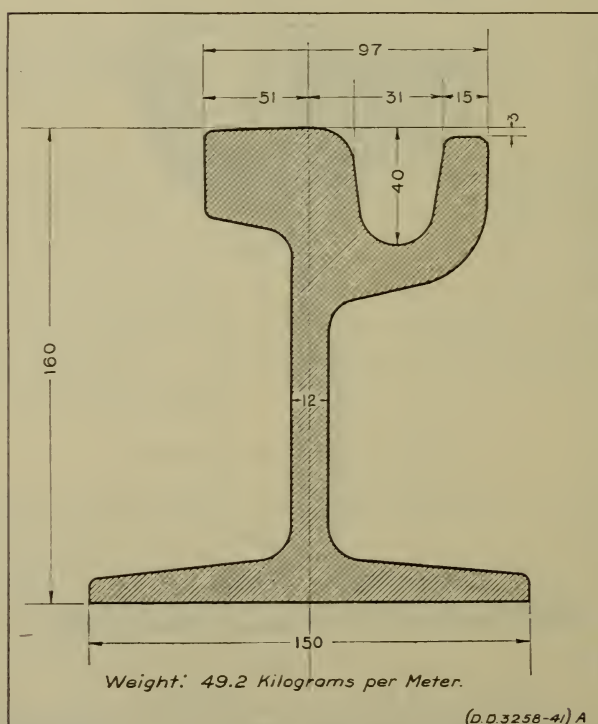


FIGURE 55.—Profile of 49.2-kilogram rail, Valparaiso tramway

side of the rails. In addition it pays a kilometerage charge of 6,000 pesos on the central lines and 4,000 pesos on the suburban lines.

Signaling equipment.—There is no signaling equipment in use on the system. Car dispatchers are located at central stations and wherever necessary telephones are employed for communication purposes.

Bridges and tunnels.—There are no bridges or tunnels on the system.

Motive power and rolling stock.—On the Valparaiso section there are 100 wooden single and double deck cars, mostly of the single-truck type and equipped with hand brakes. The majority of the motors are of German manufacture but there are a few American, Belgian, and French types in use. The bodies of the cars were built in Chile some time ago and will shortly have to be replaced. The

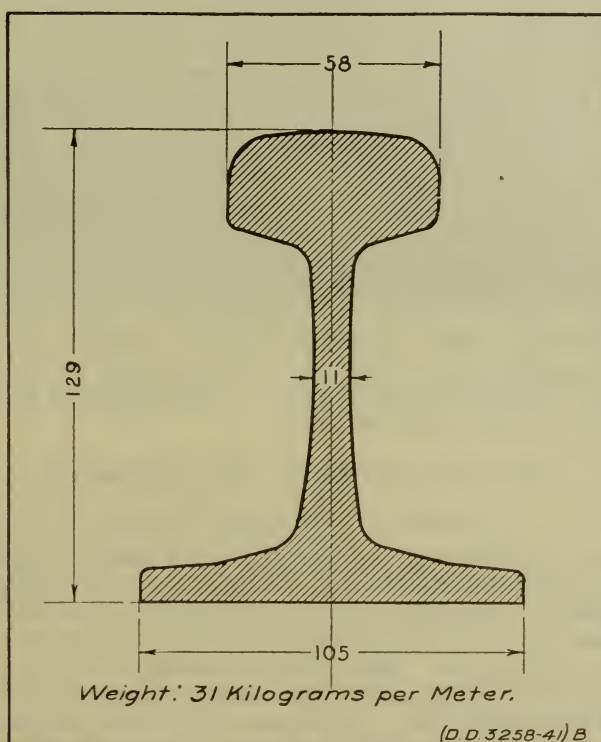


FIGURE 56.—Profile of 31-kilogram rail, Valparaiso tramway

cars are of various sizes with seating capacity ranging from 30 to 60 persons. The single-deck cars are used exclusively for first-class passengers while the top deck of the double-deck cars is used for second-class passengers. Cars are operated individually and no couplers or hook-ups are used.

On the Vina del Mar section there are 23 modern double-deck 2-truck cars, each with a seating capacity of 100 passengers. These cars were purchased from Belgium in 1923 but are equipped with American motors. They are of light steel low-slung construction and entirely suited for the requirements of the service. Air brakes and all modern appliances have been installed. The seats in the first-class section are upholstered in leather and those of the second class are of wooden construction. In addition, the company owns and

operates five autobusses on this part of the system. The chassis and motors were manufactured by the Brockway Motor Co. of New York City, but the bodies were constructed locally.

Power.—Electricity is used for power. It is obtained from a steam generating plant located in Valparaíso; a hydroelectric plant situated at Penuelas, a few miles inland from the city; and the balance of the electricity is purchased from the Compañía Refinería de Azúcar de Vina del Mar, and the Compañía Chilena de Electricidad, of Santiago. The major portion of the power consumed is purchased from the last-named company. It has been determined that this method is more practical and economical than to generate the entire amount required. In addition, the capacity of the two generating plants now owned and operated by the company is not sufficient to meet the city's needs. The Penuelas hydroelectric plant has a maximum capacity of 4,000 kilowatts, but is now used only during peak loads since the water supply of the lake is neither sufficient nor constant enough to permit the use of this plant at other times. Occasionally during the winter months when there are heavy rains, this plant can be worked at maximum capacity. The steam plant has a maximum capacity of 4,000 kilowatts, but it is now reserved solely for peak loads and emergencies. Coal is used for fuel at the steam plant and generally is purchased locally, depending entirely on the price.

Repair shops.—There is only one repair shop maintained by the company and this is located in Valparaíso at 1203 Independencia Street. The shop when working to capacity employs 350 workmen and repairs annually about 750 cars. It is equipped with all necessary power-driven tools for making repairs. The equipment is of German, British, and American manufacture.

COMPAÑÍA ELECTRICA DE CONCEPCION

(Concepcion to Talcahuano Street Railways)

The Compañía Electrica de Concepcion, a Chilean company which receives no subvention from the Government, operated a street railway system between Concepcion and Talcahuano, as well as within the limits of these two cities of approximately 30.6 kilometers of trackage during the calendar year 1926. Of this amount, 20.9 kilometers of track are operated within the city limits, while 9.7 kilometers are operated between the cities. In August, 1927, the company had 1.7 kilometers of track under construction and proposed to construct an additional 1.9 kilometers. The company was organized in 1906 during which year the Talcahuano, Talcahuano-Concepcion, and the urban lines of Concepcion were constructed. These lines were operated by animal traction until 1908 when they were electrified.

Operating officials.—The management of the system is entirely in the hands of Ricardo Fuller, whose title is that of administrator. The president is Pedro E. Moller. The manager is A. Reed. They should all be addressed in care of the company Avenida Ejercito, Concepcion, Chile.

Purchases.—All purchases made by this company, whether of domestic or foreign merchandise are made, after public tender, by the office of the administrator at Concepcion.

Finances.—The balance sheets and profit and loss statements of the Compañía Electrica de Concepcion for the calendar years ended

December 31, 1925 and 1926, follow. These statements include other activities of the company besides the operation of its railway line.

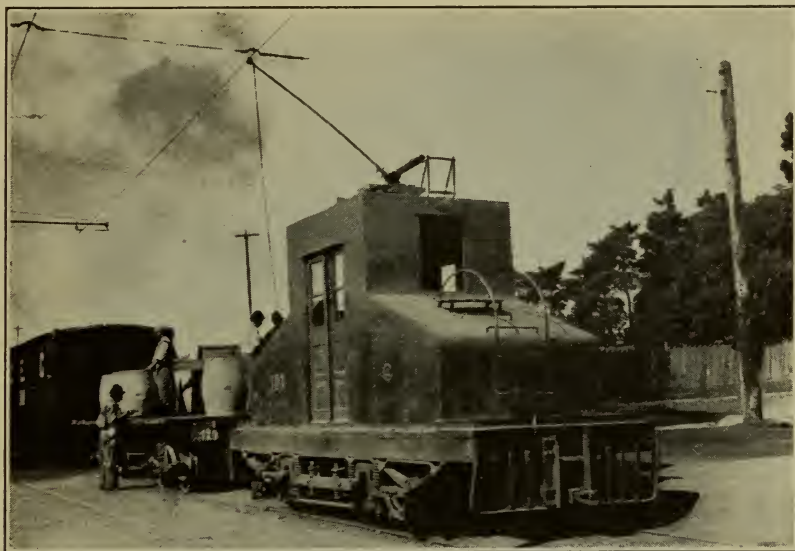


FIGURE 57.—Type of electric freight locomotive used between Talcahuano and Concepcion

GENERAL BALANCE SHEET FOR THE YEAR ENDED DECEMBER 31, 1925

ASSETS

	Pesos
505 shares at 11 pesos.....	5, 555. 00
Concepcion office.....	5, 899, 387. 57
Furniture and fixtures.....	7, 415. 00
Sundry debtors £1,818 5s. at 39.90 pesos.....	72, 419. 41
Grace Bros. & Co. £48 9s. 8d. at 39.90 pesos.....	1, 934. 47
Duncan Fox & Co.....	238, 695. 07
Bank of Chile.....	1, 982. 15
	<hr/> 6, 227, 388. 67

LIABILITIES

	Pesos
Capital.....	2, 500, 000. 00
Mortgage debt.....	1, 778, 086. 96
Interest on bonds.....	516, 146. 40
Sundry creditors.....	68, 884. 99
Depreciations.....	1, 364, 270. 32
	<hr/> 6, 227, 388. 67

PROFIT-AND-LOSS STATEMENT FOR YEAR ENDED DECEMBER 31, 1925

DEBIT

	Pesos
Interests and discounts.....	182, 929. 75
Income tax.....	71, 570. 02
Employees' retirement fund.....	8, 842. 65
Office furniture and equipment.....	1, 085. 00
Workmen insurance (law 4054).....	13, 969. 35
Gratification of employees and participants.....	37, 916. 21
Depreciation accounts.....	47, 799. 24
	<hr/> 364, 112. 22

CREDIT

	Pesos
Traffic receipts.....	364, 112. 22
	<hr/> 364, 112. 22



FIGURE 58.—Type of urban cars used at Concepcion and Talcahuano

BALANCE SHEET FOR THE YEAR ENDED DECEMBER 31, 1926

ASSETS		Pesos
Shares (505 at 11 pesos).....		5, 555. 00
Concepcion office.....		6, 220, 302. 56
Furniture and utensils.....		7, 000. 00
Grace Bros. & Co. £161 9s. at 39.65 pesos.....		6, 401. 49
Duncan Fox & Co.....		285, 658. 02
Banco de Chile.....		1, 997. 01
Various debtors £34 9s. at 39.65 pesos.....		1, 366. 93
Cash.....		71, 965. 54
		<hr/> 6, 600, 246. 55
LIABILITIES		Pesos
Capital.....		2, 500, 000. 00
Mortgage debt.....		1, 788, 086. 96
Interest on bonds.....		617, 951. 82
Creditors.....		75, 675. 35
Balance.....		1, 628, 532. 42
		<hr/> 6, 600, 246. 55

PROFIT-AND-LOSS STATEMENT FOR YEAR ENDED DECEMBER 31, 1926

DEBIT		Pesos
Furniture and utensils.....		415. 00
Interest and discounts.....		185, 458. 82
Income tax.....		64, 792. 24
Employees' fund.....		10, 245. 75

	Pesos
Laborers insurance (law 4054).....	20, 440. 70
Participations.....	17, 672. 85
Gratifications.....	20, 220. 00
Balance.....	264, 262. 10
	<hr/> 583, 507. 46
CREDIT	
	Pesos
Receipts from traffic.....	583, 507. 46
	<hr/> 583, 507. 46

Traffic.—During the calendar year 1926, all the lines of the system transported 21,014,302 kilograms of freight and 8,684,080 passengers.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The system is of 1.435-meter gage throughout.

Grades.—The maximum up grade on the lines is 3.4 per cent, for a distance of 170 meters, while the maximum down grade is one of 2.4 per cent for a distance of 130 meters.



FIGURE 59.—Interurban electric cars operating between Talcahuano and Concepcion

Curves.—The radius of the minimum curve on the system is 10 meters.

Ballast.—Sand and stone are used as ballast.

Ties.—Ties of roble pellin, secured in southern Chile, 6½ feet by 8 by 3 inches spaced on 2-foot centers, are used.

Rails.—On the interurban section of the lines, Lorrain type (tee) 60-pound rails, 4 inches high and one-fifth inch wide at the head, in sections of from 30 to 45 feet, are used. In the cities, the Victoria urban type groove rail of 74 pounds, in sections of 30 to 45 feet, is used.

Fuel.—The electricity used in the operation of this street railway system is secured from their own power plant, in which are installed two British (Allan and Co., Belfast, Ireland) generators of 510 horsepower each.

Signaling.—Telephones are used for signaling on the interurban lines.

Maintenance.—The lines are kept in condition to stand the traffic required.

Motive power and rolling stock.—During the year 1927, the company operated three 50-horsepower electric mules, for hauling freight from the port to Concepcion, 10 freight cars, 4 American-built pas-

senger cars with motors at either end and capable of carrying 40 first-class passengers, and 4 trailers holding 60 second-class passengers. At the present time, it is planned to equip the trailers with motors. On the urban lines there are 38 double-deck passenger cars of wooden construction, capable of carrying 20 first-class passengers on the lower deck and 24 second-class passengers on the upper deck. A great deal of the new rolling stock is being built in Concepcion using imported Belgian and German trucks.

Brakes.—The interurban cars are equipped with air brakes while all other rolling stock use hand brakes.

Couplers and buffers.—Link and pin couplers without buffers are used.

Repair shops.—There is one repair shop located at Calle Rengo, Concepcion. When working to capacity it employs 60 men. The shop is equipped with 17 power-driven machine tools including lathes and cutters. Approximately 47 cars are repaired each year.

IQUIQUE TRAMWAY CO.

This tramway was originally placed in operation in 1885 when 8 kilometers of track were laid, over which cars were propelled by means of animal traction. Since that time 6.4 additional kilometers of track has been constructed and the entire line converted to gasoline motor rail cars. The line is a privately owned concern, the principal owner being David Richardson, a British subject of long residence in Chile. Stock has been sold in the company from time to time by Mr. Richardson, although he has always held the controlling interest and acted as the chief operating official. At the present time the line is in the process of liquidation owing to the competition of bus companies. The line is now operated on a part-time schedule by former employees of the company who pay a daily rental to Mr. Richardson for the use of the right of way. The track is equipped with 36-pound rails laid on wooden ties 6 feet by 8 by 5 inches. The company operates one repair shop which has very limited facilities and at the present time is scarcely able to care for the immediate needs of the present operators. All purchases are made direct by Mr. Richardson who should be addressed in care of the tramways at Iquique.

COMPAÑÍA URBANO DE CHILLAN

The Compañía Urbano de Chillan operates two animal traction lines, one 4.8 kilometers in length connecting the railway station with Paso de Piedra and the other extending from the central market to the Qunita Agrícola, a distance of 4 kilometers. It is expected that approximately 3 miles of extensions will be made to both lines in the near future. The line was inaugurated approximately 50 years ago and was purchased by Roberto Lara, its present owner, in October, 1926, for 163,000 pesos (\$19,897 United States currency). The company is capitalized at 200,000 paper pesos.

Purchases.—Purchases are all made in the open market by Roberto Lara, Casilla 74, Chillan. In connection with the extension program to be carried out during 1928, it is expected that used equipment will be purchased in Santiago.

Traffic.—The line carries passengers only and while no statistics are available, it is estimated that approximately 700,000 persons are carried annually.

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage of the lines is 1.435 meters.

Ballast.—Earth and sand are used for ballast.

Ties.—Ties of Chilean oak, 6 feet $4\frac{3}{4}$ inches by $13\frac{1}{4}$ by 7 inches, spaced on 30-inch centers, are used.

Rails.—Rails weighing 27 pounds to the yard, in sections of $21\frac{1}{2}$ to 22 feet, are used.

Bridges.—There is one small wooden bridge.

Motive power.—The lines are operated by means of animal traction, using about 200 horses. No plans are being considered at the present time for electrifying them.

Rolling stock.—As of November 1, 1927, the company operated 20 cars; 6 are used for first-class passengers, 9 with 10 first-class seats

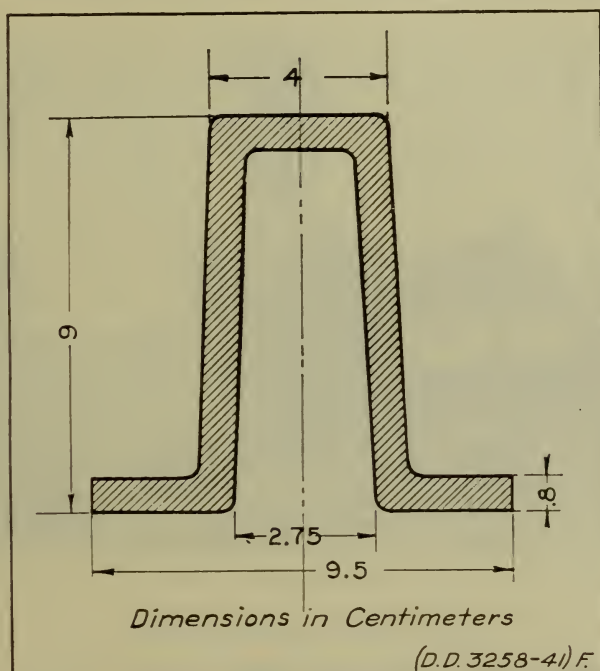


FIGURE 60.—Cross section of rail used by Compañía Urbana de Chillan on animal traction line

on the bottom deck and 10 second-class seats on the upper deck, and 5 open cars.

Repair shops.—There is one small repair shop located midway between Chillan and Chillan Viejo, which is equipped with a forge, small gasoline-driven lathe, planer, and bench tools. The shop employs five men and repairs approximately six cars per year.

SOCIEDAD FERROCARRIL ELÉCTRICO DE VILLA ALEGRE

VILLA ALEGRE STREET RAILWAYS

This line was first inaugurated as an animal traction line, about 30 years ago. In 1915 the Sociedad Ferrocarril Eléctrico de Villa Alegre took possession of it and in 1922 electrified the system at a

cost of 480,000 pesos (\$58,536 United States currency). In December, 1926, the company abandoned the use of electric power for animal traction and the line is now being operated in this manner. It is principally used for the carriage of freight between the railway depot and Villa Alegre, a distance of 4.8 kilometers, and from there to San Xavier, a distance of approximately 3.2 kilometers, or a total distance of 7.2 kilometers. It is understood that the company intends to equip their cars with small American motors, and if these plans materialize it will construct 3.2 additional kilometers of sidings. During the year 1926 about 2,600 passengers were carried.

Operating officials and purchases.—Julio E. Lara, Villa Alegre, Chile, is the manager and chief operating official. All purchases are made direct by Señor Lara, who should be addressed as above.



FIGURE 61.—Type of passenger car used on the Sociedad Ferrocarril de Villa Alegre, at Villa Alegre

RIGHT-OF-WAY CHARACTERISTICS

Gage.—The gage is 1.435 meters throughout.

Grades.—There is a small grade between Villa Alegre and the depot.

Ballast.—No ballast is used.

Ties.—Ties made of Chilean oak, 5 feet 9 inches by 8 by 6 inches, are used.

Rails.—Rails weighing 20 kilograms to the meter, in sections of 10 meters each, are used.

Rolling stock.—During 1927 the company operated 2 freight cars equipped with two long seats for passenger service, and in addition 11 freight cars.

Repair shops.—There is one repair shop located at Villa Alegre which employs two men. The shop repairs an average of six cars yearly. A gasoline motor-driven lathe, hand shaper, upright drill, and band saw constitute the principal equipment of the shop.

FERROCARRIL DE PANIAHUE A SANTA CRUZ

This is a privately owned animal traction railway connecting the towns of Paniahue and Santa Cruz, a distance of 3.5 kilometers. It was opened to traffic in 1915. The railway is of 0.75-meter gage

and uses rails weighing 10 kilograms to the meter. It is owned by Valdivieso & Errazuriz, with offices in San Bernardo.

During 1926 its declared capital was 92,300 pesos. During that year it transported 36,375 passengers and 2,094 tons of freight. Its gross receipts were 16,916 pesos while its expenses were 13,085 pesos. The company operates three passenger cars and three open freight cars.

FERROCARRIL URBANO DE COQUIMBO

This company operates an animal traction line in the city of Coquimbo, 1 kilometer in length. It owns two cars and four animals, and carries about 30,000 passengers annually. The line should be addressed as follows: Ferrocarril Urbano de Coquimbo, Coquimbo, Chile.

FERROCARRIL URBANO DE SAN FELIPE

This company operates an animal traction line in the city of Felipe, 11½ kilometers in length. The company owns 10 cars and 31 animals, and carries about 190,000 passengers annually. It represents an investment of 111,340 pesos. The line may be addressed as follows: Ferrocarril Urbano de San Felipe, San Felipe, Chile.

FERROCARRIL URBANO DE QUILLOTA

This company operates 7 kilometers of animal traction line in the town of Quillota. The company operates 8 cars and has 24 animals. It represents an investment of 170,000 pesos. The line should be addressed as follows: Ferrocarril Urbano de Quillota, Quillota, Chile.

OTHER ANIMAL TRACTION LINES

The following list indicates the names and addresses of the principal animal traction lines not previously mentioned. Names of operating officials are not available but in view of the fact that they are all small companies, it is presumed that communications addressed to the manager of the line would receive attention.

- Ferrocarril Urbano de Santa Elena, Santa Elena, Santiago, Chile.
- Ferrocarril Urbano de Santiago á Blanqueado, Santiago, Chile.
- Ferrocarril de Peñaflor, Peñaflor, Santiago, Chile.
- Ferrocarril Urbano de Melipilla á Huenchun, Melipilla, Chile.
- Ferrocarril Cartagena á Las Cruces, Calle Huerfanos 1059 (Oficina No. 2), Santiago, Chile.
- Ferrocarril Urbano de Santa Ines, Santa Ines, Chile.
- Ferrocarril Buin á Maipo, Buin, Province de O'Higgins, Chile.
- Ferrocarril de Santa Rita, Santa Rita, Province de O'Higgins, Chile.
- Ferrocarril Urbano de Molina "La Compañía." Molina "La Compañía." Province de O'Higgins, Chile.
- Ferrocarril Urbano de Paniagua a Santa Cruz, Province de Curico, Chile.
- Ferrocarril Urbano de Molina, Molina, Chile.
- Ferrocarril Urbano de Constitucion, Constitucion, Chile.
- Ferrocarril Urbano de San Javier, San Javier, Chile.
- Ferrocarril Urbano de Parral, Parral, Departamento de Parral, Chile.
- Ferrocarril Urbano de San Carlos, San Carlos, Chile.
- Ferrocarril Urbano de San Vincente, San Vincente, Chile.

APPENDIXES

Appendix A.—CHILEAN RAILWAY LAW

DECREE—LAW NO. 342

SANTIAGO, CHILE, *March 13, 1925.*

The Government commission, in agreement with the council of the secretaries of state, issues the following *General Decree—Law Appertaining to Railroads.*

TITLE I.—GENERAL PROVISIONS

ARTICLE 1. The present law refers to railroads of all kinds existing at the time of its promulgation, to those that may be built in the future, and to their relation to other transportation routes by land, air, and water.

Moreover, its provisions shall apply to existing private railroads, provided they do not run counter to the rights and obligations conferred upon the enterprises by the laws granting the concessions; and to State-operated railroads as far as they are not incompatible with the provisions of the special laws governing their administration.

Transportation via lakes and rivers is subject to the operation of the present law, when it forms part of the transportation system managed by the concessionary railroad companies.

The provisions contained in Titles IV and V apply to the railroads whose chief object it is to carry passengers, with the modifications indicated for adjacent lines in a general ruling that will be issued by the President of the Republic.

TITLE II.—CONCESSIONS TO PRIVATE PARTIES

ART. 2. The right of granting permits for the construction of railroads for public service, as well as branch lines and other lines for private use, belongs to the President of the Republic.

Excluded from this provision are railroads to be used for agricultural or industrial purposes, built within the rural district or respective industrial territory for the exclusive use of their owners.

ART. 3. Applications for concessions for railroads must be submitted to the President of the Republic, and chiefly state:

(a) The starting points and terminal of the railroad; towns located within the zone of operation, and approximate length thereof.

(b) Period of time thought necessary for submitting the final plans.

(c) Date for beginning the work, and for its completion by sections.

(d) Manner in which the capital needed for the construction and operation of the railroad is to be obtained.

ART. 4. Every application for a concession must be accompanied:

(a) By a general plan of the line.

(b) By a report giving the reason for making such application.

Included in this report there must be a general outline of the probable zone of operation, an estimate of the probable amount of traffic, stating the points of origin and destination of the various kinds of merchandise to be carried, and an estimate of the operation receipts and expenditures.

(c) By a surety bond for the amount at the rate of \$50 per kilometer, with a minimum of \$1,000.

ART. 5. Every application for a concession shall be published in the *Diario Oficial*. An abstract of said application must be published, at the expense of the interested party, for six consecutive days in a Santiago daily paper, and for six consecutive days also in a daily paper or publication in the principal city of each department crossed by the railroad.

Within a period of 30 days from the date of the first public announcement, the owners of the property to be traversed by the projected railroad, may offer such criticism as they think proper regarding the route of the line and the location of the stations.

ART. 6. The President of the Republic shall decide all matters relating to applications for concessions, upon previous report from the chief office of railroad inspection (hereinafter termed the "inspection"), and after having heard the transportation council (hereinafter termed the "council").

ART. 7. Every railroad concession must indicate:

- (a) The duration of the concession.
- (b) The period within which the respective decree will be put into the form of a public document.
- (c) The date when the final plans shall be submitted, bearing the signature of the responsible engineer.
- (d) The date when the work is to be started and completed.
- (e) The period within which the joint-stock company, referred to in article 16, will be organized.
- (f) The bond insuring the fulfillment of the conditions of the contract relative to the construction of the railroad.
- (g) The penalty incurred by the concessionaire for each month of delay in completing the work.

ART. 8. The President of the Republic may grant an extension of the period of time referred to under (b), (c), (d), and (e) of the preceding article.

ART. 9. Upon the granting of a railroad concession, the concessionaire shall pay a fee of \$10 per each kilometer length of the line, and one of \$40 per kilometer upon approval of the final plans, with a minimum of \$100 in the former and \$400 in the latter case.

Each time an extension of the period stipulated in the concession decree is obtained, the concessionaire shall pay a fee of \$20 per each kilometer length of the line, and a total of not less than \$200.

Upon approval or transfer of a concession, there will be paid a fee of \$50 per kilometer, with a total of not less than \$500.

ART. 10. The concession decree grants the concessionaire the right to obtain from the respective recording judge, permission to make surveys within State, municipal, or private territory, for the preparation of the final plans of the work.

The surveys which the interested party will have the right to make, shall be stipulated in a general way in the regulations accompanying this present law, without prejudice to the special provisions stated in the concession decree.

ART. 11. The President of the Republic may grant the use of State territory necessary to the line and its branches, and permission to use public roads, if he believes it proper in the general interest. In both cases this right of use will be granted gratuitously during the first five years of the concession.

ART. 12. The concessionaire will be reimbursed for all customs duties that he may have paid upon machinery, equipment, and materials brought in for the construction and operation of the railroad during the first five years of the life of the concession.

This reimbursement applies only to such objects, as, in the opinion of the council, can not be replaced by others of national manufacture, and for such quantities as may be determined by the President of the Republic, on the advice of said council.

ART. 13. During the first 10 years of the life of the concession, the railroad lines constructed after the promulgation of the present law, will be exempted from the payment of the income tax under class 1.

The appraisal of the immovable property shall be made with regard to the land occupied by the railroad and its branches, at the same average price unit for all adjacent land, within a radius of 100 meters.

Buildings of any kind taken over for the operation of the railroad shall be appraised on the basis of the price of the dwelling houses in the respective locality.

ART. 14. The duration of the concessions will be fixed by the President of the Republic.

This period may not be less than 30 years, nor more than 90, for enterprises of public service.

ART. 15. Branch lines for industrial establishments of whatever nature, may be constructed, preferably by the railroad company with which they are connected as auxiliary lines of the original line.

As a material aid, they may be ceded outright to the interested parties, who, in such case, will be given permission to own and run their trains over the connecting lines, according to the stipulations of article 52, and in such manner that the running of the trains of the various concessionaries may be effected under conditions of maximum efficiency.

ART. 16. Within the period stipulated in the concession decree, and for the construction and operation of the railroad, the concessionaire must organize a Chilean joint-stock company, under separate management.

This company shall represent the concessionaire in all rights and obligations derived from the concession, but it may not, without previous authorization from the President of the Republic, make over the concession to third parties, either by transfer, lease, merger, or any other act by which the total or partial operation of the railroad might be transferred.

Branch or switch lines proceeding from the original line shall be considered as auxiliary lines of the same.

However, in cases where such extensions are declared to be of regional or general interest by the President of the Republic, an independent concession will be granted them at the request of the council. In such cases the President of the Republic may authorize their joint operation up to the period of expiration of any one of the concessions.

ART. 17. The capital of the company must be divided into paid-up shares. Bonds may be issued only when the total capital has been obtained and paid in, and only when at least 50 per cent of this capital has been invested in the railroad.

In no case shall the amount of the bonds issued be more than twice the amount of the capital stock.

Bonds intended for obtaining funds for the carrying out of the construction of the main line, shall be issued on the basis of their complete amortization before the expiration date of the concession.

To insure the fulfillment of these provisions, no issue of bonds may be effectuated without previously obtaining the permission of the President of the Republic.

The capital stock of the company shall not be used for any purpose other than that of the railroad.

The amount of compensation in money or shares of stock to be paid the original concessionaire by way of reimbursements for expenses incurred and payment for his personal services, will be determined by the President of the Republic on the presentation of the bills and vouchers by the inspection.

ART. 18. The construction of the various railroad works shall be carried out in strict adherence to the approved plans, excepting such changes in details as may be authorized by the inspection without fundamentally changing the approved plan.

The companies must maintain an engineer in charge of the work as technical representative, sufficiently empowered to reach an understanding with the inspection on all measures relating to the work of construction.

At the request of the inspection, the Government will be entitled to demand that the technical representative be replaced by another, whenever such action is deemed necessary for the proper progress of the work.

ART. 19. The railroad concessions shall be annulled:

(a) If the concessionaire does not sign the contract before depositing the guaranty; if the final plans are not submitted; and if the work is not begun within the stipulated dates.

(b) If the work is not completed within the stipulated date. The annulment will be effected by decree of the President of the Republic.

ART. 20. In cases referred to under (a) of the preceding article, the deposit of guaranty is placed into the general fund for railroads, treated of under Title VII.

Similar disposition is made of the fines collected by reason of delay in completing the work.

ART. 21. When annulment occurs for the cause stated under (b) of article 19, the President of the Republic shall order the sale of the concession at public auction, on the basis of an appraisal of the work already done, materials, supplies, etc., made by the inspection which will take charge of the railroad.

ART. 22. The terms of the sale shall fix the guaranty which the bidder must present with his bid to insure the completion of the work. The bids may be lower than the appraisal.

Ten per cent of the amount of the accepted bid shall be placed into the general railroad fund.

From the remaining 90 per cent, deductions shall be made for expenses incurred, and for refunds to the company for customs duties, in accordance with the provisions of article 12.

These amounts shall also be placed into the general railroad funds, and the balance placed with the company that buys the lapsed concession.

If no bidders appear at this first auction, a second shall be called after an interval of not less than three months, and on the same terms.

If no bidder appears at this second auction, the concessionaire shall lose all his rights, and the part of the work completed, materials, supplies, etc., shall pass into the property of the state, increasing the assets of the general railroad funds.

The council may divert these properties to purposes that it may deem proper, in the interests of the railroad intrusted to it by the present law.

ART. 23. If the operation of a railroad line be interrupted along its entire length, or part of it, the President of the Republic may authorize an inspection to take necessary measures, at the expense of the company, to insure temporary service.

If within three months after inauguration of the temporary service, the company does not resume operation insuring its continuance, the President of the Republic may declare the concession annulled, and thereupon transfer it to third parties, in the manner indicated in the preceding article.

ART. 24. Companies may not extend the railroad lines without express authorization from the President of the Republic, after the latter shall have conferred with the inspection and chief council of railroads.

In case of infraction, the President of the Republic may declare the concession annulled, and transfer it to third parties in the manner indicated in article 22.

ART. 25. Annulment, as indicated in articles 19 and 23, shall not be declared in cases of force majeure duly verified by the President of the Republic.

ART. 26. After the expiration of the period of the concession, the company may continue the operation of the railroad for successive periods of 30 years, on terms to be stipulated within four years preceding the last year of the concession, or each of the periods following, as the case may be.

Among these terms are the following:

(a) The obligation to execute, within stated periods, new works of development, extension of lines, construction of branch lines that are tributary or connected with such extension, etc., which the President of the Republic shall determine upon the proposal of the council accepted by a majority of not less than three-fourths of its members.

(b) The obligation to place that portion of the net receipts, corresponding proportionately to the capital amortized within the previous period or periods, into the general railroad fund.

ART. 27. In case no agreement is reached between the President of the Republic and the company on the terms of the extension of time referred to in article 26, the concession shall be considered annulled, and the President of the Republic shall offer it for sale at public auction, requiring the bidders to comply with the conditions indicated in the terms of the auction.

It shall be an essential condition of the auction that the bidder, and consequently the joint-stock company that represents him, in conformity with the provisions of article 16, take over, preferably, the service of the bonds that may have been issued.

The company buying the annulled concession shall be obligated to take over all properties pertaining to the railroad.

After deducting expenses incurred, the proceeds shall be shared between the general railroad fund and the company buying the annulled concession proportionately to the amount of capital amortized within the previous periods, and to the amount of capital yet to be amortized, in accordance with the appraisal to be made in each case.

If no bidders appear, the President of the Republic shall establish new extension terms, and if the company does not accept them, the President shall order a new auction on these terms, and so on, successively.

ART. 28.¹ The state may acquire a railroad at any time, upon payment, after fair expert appraisal, of the value of the installations, properties, and all rights that constitute the enterprise in its entirety, deducting that part of the capital that has been amortized.

If the expropriation is effected before 20 years have elapsed, reckoned from the date of the signing of the concession, the amount of expertly appraised value, plus a surcharge of 10 per cent shall be paid.

The appraising commission shall consist of three expert engineers, as follows: One appointed by the President of the Republic, one by the company, and one by the chief justice of the supreme court.

ART. 29.¹ In those cases where the President of the Republic, upon the proposal

¹ Modified by the Decree-Law No. 604, Art. 2.

of the council, may think it desirable to expropriate a railroad, he shall request from the National Congress the enactment of the proper law, and the funds necessary to pay the amount to be fixed by mutual agreement or appraisal proceedings, as indicated in the preceding article.

TITLE III.—RIGHT OF WAY GRANTED TO RAILROADS

ART. 30. When a railroad has been granted a concession, and its construction authorized by the state, there shall be subject to expropriation, for purposes of public utility in conformity with the plans approved by the President of the Republic, municipal and private lands that may be necessary: For the construction of the railroad, its branch lines and access to the stations; for extensions necessitated by the increase of traffic; for alterations intended to improve the line or sections of it, or to facilitate connections with the lines of other companies; for new construction work or outworks that may be required for the protection of the line and railroad bridges; for erecting water towers; for opening up quarries and pits to obtain ballast for the railroad; and for new works and maintenance of the line.

In each case, steps to secure right of way must be taken within six months of the signing of the decree of approval of the plans in question.

The land shall be turned over to the company in accordance with law No. 3313 of September 29, 1917, determining the questions of right of way and valuation of the lands and damages.

ART. 31. The President of the Republic may grant railroad companies the right to temporarily occupy municipal or private lands for the construction of provisional lines, workshops, warehouses, storehouses, and for any other services that may be necessary to insure the expeditious construction of the works mentioned in the preceding article, or for the building of roads and auxiliary works needed to insure continuity of traffic in case the present line is in use, or when it is necessary to do work on the line that may interrupt the running of trains.

Temporary right of way shall be accorded upon payment of a leasing rent, and indemnification for damages or deterioration of any kind that may be occasioned to the lands occupied. This right of way shall be granted in accordance with the procedures stated in law No. 3313 of September 29, 1917.

ART. 32. The railroad company soliciting the grant of right of way may request that at the time the amount of rent and indemnification that shall be paid for temporary occupation is fixed, there shall also be determined the appraisal of the land value and amount of damages; and at the time when the arbitrators give notice of this amount, the company shall have the right of option as to temporary occupation or to expropriation.

ART. 33. As public utilities, railroad companies shall have the privilege of right of way, fixed by law, respecting adjoining lands that may be required for construction work, repairs and maintenance of the line and its branches, for maintaining clear and unobstructed transit over the lines, and for the extraction of sand and stone, or similar materials required for the construction and maintenance of the line.

ART. 34. No one is permitted to enter upon, station themselves, or walk on the railroad tracks, or drive animals across them, or place freight or any other objects on them, or impede the free passage of trains in any manner whatsoever.

Infraction will be penalized by a fine of 50,000 pesos, exclusive of any indemnities to which such infraction may give rise.

ART. 35. On lands adjacent to railroads, and at a distance of less than 20 meters from the tracks, it is not permitted:

(1) To dig trenches, make excavations, exploit quarries or mines, build dams, reservoirs, pits or any similar work that might weaken the roadbed of the line.

(2) To erect buildings covered with thatch or other combustible material.

(3) To build warehouses or storehouses of inflammable or combustible materials.

ART. 36. It is also not permitted, at a distance of less than 5 meters from the tracks:

(1) To erect buildings, elevations, or other structures more than 5 meters high above the level of the tracks.

(2) To have openings on to the tracks in any walls or fences that may be erected; it is permitted, however, with the approval of the authorities, to have exits on properties which the railroad may cross.

(3) To build warehouses or storehouses for produce, building materials, and for any other objects whatsoever.

ART. 37. Nor is it permitted:

(1) To erect walls or fences at a distance of less than 2 meters from the railroad tracks; in no case may the fence be built of inflammable or combustible materials.

(2) To plant trees within 12 meters from the track.

(3) To cut down trees planted at this distance, unless a permit by the administrative authority of the department after previously conferring with the company. This also applies to the cutting down of trees nearer to the tracks, and standing there at the time the railroad was being built.

ART. 38. No plantings or other agricultural cultivation of any kind, shall be carried on in a way that might cause damage to fences, sustaining walls, or other parts of the railroad line, or that might clog the drains of the roadbed, choke up the ditches, or loosen earth from the embankments.

When the railroad is operated by steam locomotives, the planting of agricultural products, such as grain, cotton, etc., may not be carried on at a distance of less than 20 meters from the railroad tracks.

This distance may be reduced to 10 meters, provided that at all times there is maintained at such distance a ploughed furrow at least 1 meter wide. Transgression of this provision exempts the company from all responsibility in case of fire.

ART. 39. Buildings, mining works, dams, pits, reservoirs, plantings, fences, and other works prohibited as per articles 35, 36, and 37, and located nearer the tracks than expressly permitted by said articles, at the time of the building of the railroad, are subject to compulsory expropriation at the request of the constructing company, in order to insure safe traffic over the railroad.

In case expropriation is not resorted to, it is prohibited to rebuild said warehouses, dams, reservoirs, and other constructions in case they are destroyed, and no other work may be done to them except such as is necessary to put them into the same condition as they were in at the time of the building of the railroad.

ART. 40. Notwithstanding the provisions of articles 35 and 36, there is no objection to:

(1) Dumping noninflammable material alongside the tracks flanked by embankments, but the material must not exceed the height of the embankment.

(2) Placing or temporarily storing materials or articles meant to be used immediately for construction or agricultural purposes, or to depositing or storing harvest crops during the harvest season.

If the products or materials, stored or deposited, as herein stated, catch fire as a result of the operation of the railroad, the company is not obligated to indemnify.

ART. 41. There may be permitted: The temporary depositing or storing of goods at a distance of less than 5 meters from the track, in virtue of a resolution adopted by the inspection after conferring with the company, provided no risk to the railroad, or interruption of its service, is involved, but in no case may these goods include explosives or easily ignited material.

ART. 42. Anyone who transgresses the provisions of articles 35, 36, 37, and 38 regarding buildings, constructions, plantings, and other items enumerated in the said articles shall be fined 50 to 100 pesos, and in addition shall be obliged to destroy such work and restore the ground to its former condition.

If within the time stipulated by the inspection, the constructed works have not been destroyed and the ground restored to its former condition, then the company previously authorized by said inspection shall proceed with such work at the expense of the owner of the land. The bill, approved by the inspection, shall have the force of a legal document to insure its payment.

Anyone who transgresses the said articles, is, moreover, held responsible for any losses which the railroad may sustain as a result of the controversy.

ART. 43. The distance specified in articles 35, 36, and 37, shall be measured horizontally, from the foot of the slope of the embankment to the upper edge of the cut, and in the absence of the one and the other, it shall be measured from a line running parallel to, and $1\frac{1}{2}$ meters from, the outer rail.

ART. 44. The distances fixed in accordance with the preceding article may be reduced at the request of the owners and after hearing the railroad company, provided that, with due regard to the nature of the ground over which the railroad runs, the constructions, storehouses, and other prohibited works, do not endanger either the safety or traffic of the road.

TITLE IV.—OBLIGATORY SERVICES OF THE COMPANIES

ART. 45. The capital of the Republic is the legal seat of the railroad companies, without prejudice to the special headquarters in the capitals of the departments for business that may be transacted there, in accordance with the provision in

article 67 of the civil code, and for real property law suits that are brought before the courts of the place where the property is located.

However, claims entered for the loss or deterioration of goods accepted for transportation, or for damages and prejudices of any nature whatsoever, may be brought before the attorney of the department in the locality where the central offices of the administration are located.

No matter in what city said administration is located, the companies must maintain, in the capital of the Republic, a representative with full powers for all the intents of the present law.

ART. 46. Every railroad company is obligated to carry free of charge:

- (1) Mail pouches handled by the post offices.
- (2) The employee that the respective office may deem it desirable to send in charge of the mail pouches.
- (3) Postmasters that the postal administration may deem it desirable to station along the railroad lines.

(4) Inspectors of the State telegraph administration in those sections where State telegraph lines are within the railroad precincts.

ART. 47. They are also obliged to haul, free of charge, on regular trains, coaches that the high schools or special schools maintain for scholastic excursions, or trips undertaken for the dissemination or extending of education.

There shall be entitled to free transportation by railroad:

(a) The President of the Republic, the councilors of state, cabinet ministers, senators, deputies, the chief of the supreme court of justice.

(b) The director general of public works, the director general of the navy, the inspector general of the army, the chief of staff, and the commandants of the military divisions within the territory of jurisdiction.

(c) Members of the council and of the board of railroad inspection.

(d) The director, manager, or administrator of every national railroad company of which the invested capital exceeds 2,000,000 pesos; the members of the administrative council of State railways, the undersecretary and the section chiefs of the ministry of labor and public works.

(e) The superintendents, governors, and police judges and their secretaries within their respective jurisdiction.

(f) The court officials who may be investigating offenses committed at the stations or in the trains, or gathering information concerning accidents.

(g) Insane people, criminals, or convicts who are to be transferred from one part of the Republic to another, and the guards of the jail, or members of the State police who may be conducting them, or returning after having executed their official commission, provided they carry a certificate from the respective superintendent or governor certifying such commission, stating number and names of the insane, criminals, or convicts, and the reasons for taking them back to the institution to which they belong.

ART. 49. In transporting arms and war supplies for the account of the State, the lowest railroad tariff, reduced by 50 per cent, shall be charged.

Normal tariff rates, reduced by 50 per cent, shall be charged for transporting troops and public employees who may be traveling on the railroad in an official capacity, or for transporting all State freight chargeable to its account.

ART. 50. In case of domestic uprisings, or foreign war, the Government may, for its own account, take over the use of the railroads, guaranteeing the company a compensation that shall be determined on the basis of the average earnings of the railroad during the three preceding years.

ART. 51. The companies are obligated to permit the construction of roads giving access to the stations or branch lines serving mining companies, industrial plants, warehouses, etc., that the President of the Republic may authorize in accordance with the provisions of article 15 of the present law.

When such branch lines or roads of access are not constructed at the expense of the company, they shall be built at the expense of the interested parties, with previous permission of the Government; the company shall be obligated to haul freight on its trains from or to these branch lines without other charges to the parties interested than the payment of the supplementary tax that the tariff schedule may establish for this service.

In such cases as the council may decide, the companies themselves shall undertake to do the work, upon the deposit by the party interested, of the value corresponding to the estimate approved by the inspection.

ART. 52. The companies are also obligated:

- (a) To connect their lines with other existing railroad lines, or those that may be built in the future.

(b) To share the use of stations with competing lines, it being necessary in such case to determine by common agreement the price and other conditions for such common use.

(c) To enter into contracts with the companies of such railroads for transportation effected in common by means of the passage of the rolling stock of one company to the lines of the other.

(d) To inaugurate transportation service for passengers and freight by means of direct tickets, direct fares, and combined schedules.

(e) To apportion the items of operation and fuel and other resources at their disposal, and the price that may have been established by common agreement, among the companies that extend the running of their lines over other lines.

(f) To permit installations required by said companies in the stations of competing lines to facilitate service, on conditions previously agreed upon.

(g) To carry out supplementary work requested by the council, with or without the aid of the latter.

ART. 53.² In cases where the companies do not enter into the contracts to which reference is made in the preceding article within the period specified by the inspection, transportation service shall be effected in the manner indicated by the inspection, whilst the council drafts a final regulation after having heard the companies concerned.

The companies are obligated to respect the regulations which the council will make in such cases, without prejudice to their right of bringing action before the ordinary courts.

The regulations will fix the basis and terms on which the council will decide such claims.

ART. 54. The companies shall not object to having another railroad line cross its lines on a different level, or one that connects with its lines or crosses its lines on the same level under conditions of safety which, in each case, the inspection shall establish.

The required work shall be done at the expense of the new company.

In case of the junction or crossing of lines on the same level, such work shall include, furthermore, the dwelling for the station master, with an adjoining piece of land of at least 500 square meters.

The expenses connected with operating junctions or crossings on the same level, as well as those of their upkeep and repair shall be apportioned between the companies on a pro rata basis.

ART. 55. Every company is obligated to permit the erection of state telegraph and telephone lines on the territory reserved for the railroad and apportion adequate quarters fitted out for telegraph and post offices at such stations as the Government shall determine.

Agents charged with the supervision and maintenance of the installations may travel freely over the entire line.

The companies are obligated to reestablish continuity of service over state telegraph and telephone wires in cases of accident, and send a report of such accident, or of any other accident arising from any cause, to the state officials.

The expenses incurred from such cause shall be borne by the state.

ART. 56. The expenses of governmental inspection shall be for the account of the companies.

To that end, the companies shall contribute annually a quota of not less than one-hundredth, nor more than five-hundredths of a centavo for each unit of traffic (passenger-kilometer or ton-kilometer), as the President of the Republic may determine.

During the construction, and reckoned from the date when the final plans are approved, the companies shall pay in annually an amount of \$2,000 plus \$100 for each kilometer of railroad to be constructed.

The deposits of the companies shall be made quarterly in advance to the state treasury, to the order of the superior council of railways.

ART. 57. During the entire period of the concession, the concessionaires shall have in their managing, technical, and administrative personnel, Chilean citizens in a proportion not less than 75 per cent of all employees of the company.

The concessionaires are forbidden to employ citizens who have not completed their obligatory military service.

² Modified by Decree-Law No. 684, art. 6.

TITLE V.—RAILROAD OPERATIONS

CHAPTER 1.—*Tracks and equipment*

ART. 58. The railroad companies shall not put any part of the line into public use without previous authorization of the inspection.

This authorization will be granted only after it has been found that the work is properly completed, and that the railroad is fully equipped for operation.

ART. 59. It is the duty of every company—

(1) To always keep the line in good condition, so that the trains may be run in safety.

(2) To provide the necessary equipment as to quality, kind, and quantity, for transportation, as regards general communication between the various towns located along the line.

(3) To maintain an electric communication system between all the railroad stations along the line.

(4) To insure the proper operation of the switches at crossings.

(5) To erect gates and cattle guards and to station linemen at all points where the railroad crosses public highways on the level.

These gates must be closed before the arrival of the train and open immediately after, so that passage over the highway may not be impeded.

In case a new public highway crosses an existing railroad, it will be the duty of the authorities constructing the road to erect gates and a house for the gate-keeper of the type approved by the railroad company, with at least 500 square meters of land adjoining the gatekeeper's house.

The operation costs, as well as those of repair and upkeep, shall be defrayed by the company.

(6) To fence in, at its expense, both sides of the road all along the line. However, the inspection, with due regard to the nature of the ground over which the railroad runs, may exempt from fencing in such parts of the road as are not indispensable for the safety of traffic.

The obligation to close and repair the gates shall not hereafter devolve upon the owners of adjacent property.

In cases where, by virtue of contracts in force on the date of the promulgation of the present law, the gates belong to neighboring owners, who, at their own expense, keep them in repair, the owners shall be held responsible for any damage that may be caused the railroad on account of the bad condition of said gates, but the company shall be held responsible to third parties.

ART. 60. Besides being held responsible for damages and injury, the companies shall be obligated to carry out the work necessary to put the line in the condition indicated in the preceding article, within the period that the inspection may determine, under pain of incurring the penalty as stipulated in article 64.

ART. 61. No locomotive, coach, car, etc., shall travel over the railroad line without previous expert examination and permission of the inspection.

The rolling stock withdrawn from service for general repair, or on account of serious deterioration and expected to be returned to service, shall also be subject to examination.

ART. 62. The inspection shall have the right to exclude from use all fixed or rolling equipment of the railroad that does not meet the necessary safety requirements.

In case a company does not comply with such measure, the council shall declare, without appeal, that the company may not use the material found unfit until final decision is made.

ART. 63. Where a railroad crosses navigable rivers, it shall be constructed in such a manner as not to impede navigation.

Where it crosses small streams, estuaries, or irrigation canals, the railroad must be constructed in such a manner as not to impair the use of the water.

The President of the Republic may order such necessary changes to be made to all bridges as will permit navigation on rivers or canals that have been made navigable.

ART. 64. The President of the Republic, through the inspection, may compel the carrying out of all the obligations prescribed in the preceding articles, by imposing a fine of from 50 to 500 pesos on the company for each day of infraction.

If the work is not carried out within the stipulated period, the company may be compelled to pay a double fine, in addition to the payment of the one it has already incurred.

ART. 65. If, notwithstanding the fine imposed, the work is not done, the President of the Republic may enforce the provisions prescribed in article 23 regarding interruption of operation.

CHAPTER 2.—*Making-up of trains and schedules*

ART. 66. The make-up of trains shall be in accordance with regulations issued by the President of the Republic, in which shall be specifically stated all the conditions considered necessary for the comfort, safety, and health of the public.

ART. 67. The companies shall make public announcement of the schedules of passenger trains by means of placards posted in all the stations.

The hours of departure, and the itineraries of such trains shall not be changed until eight days after such announcement, except by special authorization granted by the inspection in unusual cases.

The time-tables of all classes of trains, and any changes therein, must be submitted for the approval of the inspection, for the purpose of insuring the safety of traffic, for the convenience of passengers, and for securing proper connections with trains of other lines.

ART. 68. Trains, according to their class, and during their run, must maintain the speed and itinerary fixed in advance. If, in consequence of accidents, or to avert danger, a train is forced to change its course, the conductor of the train must account for this action in his daybook of the trip, and he must also draw up an additional statement signed by at least three passengers, if the trains of this service are involved. For lack of this justificatory statement the company is responsible for the change.

CHAPTER 3.—*Carriers*

ART. 69.—Like any other company engaging in transportation, the railroad companies are responsible for damages and injuries arising from the acts or omissions relative to the service on the part of the managers and other employees engaged in the operation of the road. This responsibility will fall on the state if the railroad is operated by, or for the account of, the state.

ART. 70.—In the transportation of passengers and merchandise the railroad company shall be subject to the legal precepts concerning transportation contracts, provided these are not incompatible with the particular means of transportation used.

The rights, obligations, and responsibilities of the railroads shall be determined in conformity with these precepts.

ART. 71. The responsibility of the company for merchandise, vehicles, and other articles which it engages to carry begins the moment the employee, to whose care the goods are intrusted, gives the respective receipt or voucher to the shipper, or whoever may act in his name.

ART. 72. At every station there shall be kept a paginated register into which anyone may enter complaints against the service or against the employees of the railroad. The companies shall forward to the inspection copies of such complaints within three days after the date when the complaints are made.

ART. 73. Every train conductor shall keep a register or daybook in which he shall note down all incidents occurring during the trip regarding either the employees aboard the train, or the linemen, or the passengers themselves. This register shall vouch for all that has occurred during the trip unless proven to the contrary.

ART. 74. Any accident occurring on the railroad must be reported by the respective station chief to the superintendent or governor. The company must also report to the inspection within three days.

ART. 75. All trains and all stations shall be provided with medicine chests and other articles that may be needed in case of accidents.

ART. 76. Only the railroad companies may collect fares for their services in accordance with the rates and conditions authorized by the council.

If, for transportation service, a company collects a lower fare than the one it should collect according to the legally fixed rate, the council may order that this same reduction shall apply to all articles of the same category, according to the freight classification. This reduction may not be revoked except in the form established for modifying rates.

The aforesaid sanction does not exclude the levying of a fine of from 500 to 1,000 pesos, to which the company shall be liable for each day that it charges any rates not in accordance with the rules prescribed in the present law or if, in its charges, it applies rules differing from those provided for in the schedule approved by the council.

ART. 77.³ The rates shall be determined on the basis that the gross receipts will not generally exceed 30 per cent of the total fixed capital of the company

³ Modified by decree law No. 604, art. 7.

and approved by the President of the Republic, provided that the expenditures do not exceed 70 per cent of the revenues. If the proportion of expenditures should be greater, the company is obligated to prove this to the satisfaction of the council, and, in such event, the admissible limit of 30 per cent shall be increased as regards the maximum value of the operation coefficient; but the net receipts may not exceed 9 per cent of the invested (immobilized) capital.

Provided that for three consecutive years the receipts of the line exceed the indicated 30 per cent, together with an operation coefficient not above 70 per cent, or the proportionally increased limit if this coefficient rises above 70 per cent, then the council shall be entitled to proceed in the matter of modifying the rates.

It may consequently come to an agreement with the company or it may, if necessary, compel such reduction of rates as it may deem proper on the condition of not reducing the gross receipts more than 0.5 per cent below the limit stated in the present article.

The council may likewise be entitled to proceed in those cases where, in its judgment, it might be to the public interest to make changes in the rates or their conditions of collection, provided that such changes do not reduce the gross receipts of the company.

The gross receipts secured in excess of the authorized limit shall be apportioned—

Ten per cent to the general railroad fund;

Ten per cent to the reserve fund for contingencies so long as this reserve fund is less than 10 per cent of the total invested (immobilized) capital of the railroad; and the remaining

Eighty per cent will be at the free disposal of the company.

Notwithstanding the foregoing, if the net receipts should amount to more than 9 per cent of the total invested (immobilized) capital of the railroad, the surplus of net receipts above this amount shall be apportioned—

Ten per cent to the general railroad fund;

Ten per cent to the reserve fund for contingencies, provided that this fund is less than 10 per cent of the total invested (immobilized) capital of the railroad; and the remaining

Eighty per cent will be at the free disposal of the company.

The provisions of the two foregoing clauses are not applicable if the proportion between the expenditures and gross receipts is greater than 0.7 per cent except when jointly the net receipts are more than 9 per cent of the total invested (immobilized) capital, in which case the excess over and above 9 per cent shall be apportioned as follows:

Fifty per cent to the general railroad fund;

Thirty-three per cent to the reserve fund for contingencies, provided that this fund is less than 10 per cent of the total invested (immobilized) capital of the railroad; and the remaining

Seventeen per cent shall be at the free disposal of the company.

Whenever the railroad contingency fund shall have reached 10 per cent of the total invested (immobilized) capital, the council shall have the right to indicate how the sums intended for this fund shall be used for improvements to the railroad.

ART. 78. The requests submitted to the council for the fixing and modifying of rates shall be announced publicly and taken under advisement by the inspection, together with any suggestions that the interested parties may offer.

ART. 79. No rate may be changed until after it has been in effect one year except by resolution of the council granted after receiving the favorable vote of three-fourths of its members.

ART. 80. The rates and any changes in them shall be publicly announced by means of placards posted in visible places within the precincts of the station 60 days before such rates go into effect if it concern new rates or increases in existing rates or 30 days if it concern a reduction in rates.

However, the council may authorize reducing to three days the period for making prior announcement of rates applicable to temporary or casual pleasure or excursion trips.

ART. 81. At all stations there must be placed at the disposal of the public, for free consultation, books containing full information as to rates and conditions of collection as soon as the operation of the railroad is authorized. Said books must be sold at the price authorized by the council at the stations located in the principal cities of the department, in the terminal cities, and at those expressly indicated by the council.

The books containing rates and conditions of perception shall include the unit and total prices of standard rates, special rates, and additional taxes for each branch of service operated by the railroad.

There will also be included the rates for hauling persons and merchandise between the railroad stations and the domicile of the persons and delivery of the merchandise in the cities, whether this service be rendered by the railroad company directly or other companies that contract with them. In both cases these services shall be subject to the supervision and surveillance which the present law intrusts to the council and superior inspection board.

ART. 82. The standard rates shall apply uniformly to all persons using the line. Special reduced rates may be established for merchandise and special trips that need more time for shipment than the regular time established, or such rates may apply for hauling a minimum of tons of freight within specified periods.

ART. 83. Special rates shall not be given unless the shipper requests them. In the absence of such previous request, rates for shipment shall be calculated on the basis of the standard rates and conditions of collection.

ART. 84. Rates to be charged for joint shipment and delivery of freight among the companies interested shall be determined by the council.

ART. 85. Without express authorization of the President of the Republic, after hearing the superior railroad council, the companies are prohibited from establishing, either directly or indirectly, with other transportation companies, by land or water, under any condition whatsoever, rules that are not also granted to all other companies performing like services and duly authorized by the council.

ART. 86. In cases where two railroads engage in traffic of the same kind, the companies shall charge the same rates.

In fixing the proper rates the council shall take into account the most unfavorable conditions of the needs of the company.

ART. 87. Every passenger is entitled to have his baggage carried on the same train that carries him.

Included under baggage are chests, trunks, valises, and, in general, packages containing articles or personal belongings for the use of passengers.

ART. 88. The companies shall give preference, on any class of train whatsoever, to parcel-post packages carried at fast-train rates.

Under parcel-post packages are included loose bundles not exceeding 20 kilos in weight, containing any kind of merchandise except dangerous objects.

ART. 89. It is not permitted to take into passenger coaches any articles that might cause annoyance, explosions, or fire.

No person shall be allowed on the train who causes annoyance to other passengers, or who refuses to comply with the regulations.

It shall devolve upon the company to eject from stations and trains any persons indicated in the preceding clause, and this action shall be attested to by a statement signed by at least two passengers.

The ejection from the train shall be effected at the first station, along with the baggage, with the right meanwhile to confine such person in a special compartment.

Persons afflicted with contagious diseases, or annoying to other passengers, must be carried in special compartments.

ART. 90. Every passenger is entitled to take into the coach free of cost valises, traveling bags, hats, etc., that may be stored in the latticed receptacles above the seats, or placed under the seats so as not to obstruct passage, provided their total weight does not exceed 20 kilograms.

ART. 91. Immediately upon arrival at the destination, the company shall deliver over to the passengers all the packages that constitute his baggage.

In case damage or injury has been done to any of the baggage, indemnification shall be made subject to the rate of evaluation fixed by the respective rules, according to the kind or character of the packages.

ART. 92. The companies shall not be responsible for articles that passengers carry themselves.

Likewise, the company is not responsible for jewelry, gems, money, bank notes, public-debt securities, mortgages, and other like documents contained in the baggage intrusted to the railroad for transportation, unless they have been specially registered and specified and the additional insurance tax has been paid.

ART. 93. The companies shall not refuse to receive merchandise for shipment except in the special cases indicated in the rules.

ART. 94. In every station or point designated to receive freight there shall be kept a registry in which are noted the amount of the merchandise received for shipment, and a certificate issued to the shipper, upon request, of the amount

charged, or else a receipt stating the nature and weight of the goods, the class of train, and the time in which the shipment must be made.

The shipment of the goods shall be effected in order of receipt, except in those cases where the shipper or person acting in his name agrees by written statement to a postponement.

A previous agreement for shipment does not entitle the goods to registration.

The periods within which the companies shall be obligated to effect shipment of the goods, shall be determined on the basis of the charges to be collected. The President of the Republic will fix the time when this regulation shall go into effect for all the railroads in the country.

ART. 95. Notwithstanding the provisions in the preceding article, preference shall be given the following goods:

(1) Fruits or provisions intended for daily consumption in the towns connected by the railroad.

(2) Baggage of passengers and parcel-post packages, the total weight of which does not exceed 20 kilograms, as stipulated in articles 87 and 88.

(3) Mail bags and parcel post.

(4) Articles intended for public use for which the Government may request preference in shipment.

ART. 96. Every consignor, prior to shipment of goods, shall declare the number, weight, class, and nature of the goods to be shipped.

False declaration exempts the company from all responsibility and entitles it to charge an additional tax for false declaration as established in the rate schedule.

ART. 97. On arrival of the goods any error as to price or weight reported may be corrected by the shipping station; this right is reciprocal between the companies and the public, and must be reported at the time of delivery of the goods by whom and to whom the amount of error may concern.

Any doubts that may arise as regards weight, charges, improper wrapping or packing, and condition of the goods, must be submitted at once to the inspection for decision.

If no inspector is present at the station, and the shipper does not desire to await the decision of the inspection, the matter shall be submitted to the judgment of referees designated on the arrival of the goods, one named by each party, with the right to name a third party in case of disagreement, each party paying one-half of the costs.

ART. 98. Articles found in the coaches, at the stations, or on the tracks, and all things whose owner, consignor, or consignee, does not claim within the period designated in the regulations, shall be kept in storage by the company, and a special register shall be kept for such things, stating the day and place where found, and description of the articles.

Said articles shall be advertised on billboards at the stations. If no one claims them within three months following the posting of the advertisement, they shall be sold at public auction. The receipts from the sale, after deducting expenses and anything owing the company, shall be placed in the general railroad fund.

If the goods left behind easily spoil or deteriorate, they shall be sold immediately, and the revenues disposed of as provided in this article, if no one claims them within three months of the advertising.

ART. 99. Infraction against the provisions contained in this chapter shall be penalized by fines ranging from 100 to 1,000 pesos; each day that the companies allow to pass without complying with the said regulations in accordance with orders to that effect received from the inspection, shall be considered a separate infraction. In case of repetition of the offense, a fine twice the amount of the one imposed in accordance with the foregoing clause, may be levied.

TITLE VI.—STATE SUPERVISION

CHAPTER 1.—*Superior inspection of railroads*

ART. 100. The inspection and supervision of the construction of railroads conceded to private individuals, and the operation of all the railroads of the country shall be exercised by a "superior board of railroad inspection" under the authority of the Ministry of Labor and Public Works, and consist of personnel with annual salaries, as follows:

	Pesos
1 engineer, chief inspector of railroads.....	36, 000
1 engineer, inspector.....	30, 000
3 engineers, chiefs of department.....each..	24, 000
3 engineers, first class.....do.....	18, 000

	Pecos
2 engineers, second class-----each--	15, 000
1 engineer, third class-----	12, 000
1 consulting lawyer-----	12, 000
1 secretary-----	10, 800
1 bookkeeper, first class-----	12, 000
1 bookkeeper, second class-----	10, 800
1 keeper of records-----	9, 600
1 assistant keeper of records-----	7, 200
1 draughtsman, first class-----	9, 600
1 draughtsman, second class-----	8, 400
1 clerk, first class-----	7, 200
1 clerk, second class-----	6, 600
1 clerk, third class-----	6, 000
1 porter, first class-----	4, 000
1 porter, second class-----	3, 000

The President of the Republic may appoint other visiting and resident engineers, and additional employees for the continuous supervision of the railroad construction and operation, upon request of the council, with the approval of three-fourths of its members.

ART. 101. The chief engineer inspector of railroads shall be appointed by the President of the Republic, and be considered as bureau chief.

The other personnel shall also be appointed by the President of the Republic, upon advice of the inspector.

Considered as public permanent employees, not included in the provision of article 3 of the general retirement act of August 20, 1857, are those persons whatever their title, who are under the authority of the superior railroad inspection.

ART. 102. No person shall be employed in the superior railroad inspection office who has not complied with the law regarding obligatory military service.

ART. 103. For appointment as inspection engineer, the proper professional is required.

In appointing other employees, preference shall be given to those who hold the degree of bachelor of science, in conformity with the regulations.

ART. 104.⁴ It is the duty of the inspection to exercise the powers bestowed upon it by the present law, and particularly—

(1) To see to it that the laws now in force, as well as those enacted hereafter, regarding railroads and their respective rules and regulations, are complied with.

(2) To study, and participate in all matters to which said laws may give rise, and the regulations for carrying them out, and to propose the changes that experience may counsel.

(3) To prepare for action all matters that the council must decide, or upon which it is entitled to give advice.

(4) To give their judgment regarding requests for railroad concessions, studies, plans, specifications, and estimates submitted by the concessionaires, and to authorize plans of details that would not fundamentally change the project approved by the Government.

(5) To participate in the examination and determination by the President of the Republic of the capital of each company.

(6) To see to it that the obligations stipulated in the law or decree of concession are complied with.

(7) To participate in the conveyance of the new railroad lines to public use, and to authorize such conveyance in the case of private railroads.

(8) To give their judgment regarding requests concerning rates and conditions of perception, as well as special service rules that the companies must submit for the approval of the council.

(9) To determine the technical units of the line and rolling stock for all branch lines.

New construction and acquisitions must conform to these uniform standards, in order to facilitate the interchange of rolling stock on the lines of the various companies.

(10) To authorize the schedules for all classes of trains.

(11) To determine, sufficiently in advance after consulting with the companies, the rolling stock that each railroad must keep in ordinary service with reference to probable traffic.

⁴ Modified by decree law No. 684, art. 8.

(12) To make the necessary studies for, and propose to the council the construction of supplementary work deemed proper for the improvement of the service of any railroad whatsoever.

(13) To heed the suggestions of the public and decide the claims made against the railroads, in so far as they relate to the fulfillment of the laws and regulations now in force.

(14) To lay upon the railroad companies or concessionaires the fines authorized by this law. After the fine is paid, the company that transgressed shall have the right to take an appeal, within an absolute period of 10 days, before a justice of the peace who shall settle the claim after having had a report from the inspection.

In order to determine the operation coefficient referred to in article 77, the companies shall not be entitled to include under operation expenses the amount of the fines that they may have paid.

(15) To superintend the carrying out of the standards of uniform bookkeeping, as prescribed by the President of the Republic.

(16) To examine and audit the accounts of the railroad under State guarantee or subsidy; the respective auditors shall act in conformity with the instructions given them by the inspection under whose authority they act.

(17) To cooperate with the committees created by special law for deciding disputes between the companies and its employees regarding salaries, working hours, and conditions of same.

(18) To supervise the carrying out of the provisions regarding health regulations on railroads, as prescribed by the President of the Republic.

(19) To make an annual report on the statistics of the national railroads, accompanied by maps and graphs necessary for their better understanding.

(20) To examine the machinists and other technical personnel of the company, and authorize the performance of their duties.

(21) To annually submit a report to the Ministry of Labor and Public Works regarding the administrative activity of the preceding year.

(22) To keep a complete record of all the foregoing in reference to each one of the national railroads, and compile the data and information relative to the ways of communication of bordering countries that might be of interest in making connections with the present national railroads and those that may be constructed in the future.

(23) To give their judgment concerning the effect that any proposed lines might have upon the present railroads and other ways of communication, and, in general, to give their judgment upon all transportation matters that the Government may deem proper to commit to it.

(24) To take in charge all matters relating to the international railroad congresses.

ART. 105. The inspection shall be entitled to request from the companies as much data as may be necessary to carry out its duties and achieve its aims.

Accordingly, the inspection may summon witnesses, and call for books, papers, rates, contracts, adjustments, and documents relating to the subject under investigation. This right shall be exercised in the manner stated in article 43 of the Commercial Code.

The officials of the inspection board shall have free access to the stations, workshops, tracks, trains, and properties of the railroads.

On their part, the companies shall be obliged to answer all questions on which the inspection needs information, and also to fill out the questionnaires sent to them by the inspection for statistical purposes.

ART. 106. When complaints are made by any interested party regarding acts committed by the company in contravention with the present law, the inspection shall transmit them to the company in question and fix a period within which answer must be made.

If said report makes the matter sufficiently clear, a decision shall be rendered immediately.

If the company does not reply within the stipulated period, or if the matter shall be considered serious, the inspection shall direct its personnel to make an investigation that will enable it to come to a final judgment, in order to adopt the resolution in discussion.

ART. 107. The reports that the judges may request from the inspection board shall be entitled to full faith in the decisions rendered against the railroad companies, unless proof to the contrary is submitted.

CHAPTER 2.—*Council on transportation*

ART. 108. There is hereby created a council on transportation, as follows:

- (a) A chief inspector and an assistant inspector of railways.
- (b) Two engineers, one of whom shall be in the railroad service, or that of roads under the board of public works.
- (c) One engineer in the department of harbor works.
- (d) A representative of the transportation department of the general staff of the army.
- (e) Two members of the State railroad administration.
- (f) Two representatives of private railroad companies.
- (g) One representative of the Association of Nitrate Producers.
- (h) One member of the National Manufacturers Association.
- (i) A member of the National Agricultural Association.
- (j) A member of the National Mining Association.
- (k) A member of a labor organization legally established for more than 20 years.

The Minister of Public Works and Public Highways shall preside over the meetings of the council and, when present, shall have the right of discussion and vote. In case the minister is not present, the chief inspector of railroads shall preside over the sessions, and in case of his absence, such member of the council as those present may designate.

The secretary of the inspection shall, at the same time, be secretary of the council.

The council may meet and adopt resolutions with six of its members present.

ART. 109. The members of the council shall be appointed by the President of the Republic upon proposal of three names for each candidate by the respective companies or associations, when reference is had to any of those designated under (f), (g), (h), (i), and (j) of the preceding article, and directly by the President, when reference is had to any of those designated under (a), (b), (c), (d), (e), and (k).

ART. 110. The members of the council, not ex-officio, shall be appointed for a period of six years, renewable in thirds, the members being reeligible.

The members elected to compose the first council shall be divided into three groups: Members of the first group shall hold office two years; the second group, four years; and the third group, six years.

ART. 111. No persons can become members of the council who hold or furnish bond for contracts with railroads for construction of the line or furnishing of equipment, or who are members of any association holding such railroad contract.

ART. 112. Any member of the council who fails to be present at more than eight consecutive meetings, without stating reason therefor to the satisfaction of the council itself, shall cease to be a member, and the President of the Republic shall take steps to appoint a successor, in the manner prescribed in the preceding article, for the balance of the period of his appointment.

Similar steps shall be taken in cases where the President of the Republic decides to relieve any member of the council from his functions for reasons of incapacity, negligence, or improper performance of his duties, or in case any of the positions become vacant because the holder thereof fails to discharge the duties for which he was elected member of the council, either through death or any other cause.

ART. 113. The members of the council, including the chief inspector, assistant inspector, and the secretary, shall receive remuneration proportionate to the number of meetings they attend.

The total remuneration that shall be distributed among them at the close of each semester, shall be fixed at 60,000 pesos.

ART. 114.⁵ It shall devolve upon the council of transportation—

(a) To formulate the general plans for the nation's ways of communication; to make studies and propose to the Government the measures for carrying out such plans, and to supervise the construction work.

(b) To exercise the powers delegated to it by this law in the matter of railroads, and particularly—

(1) To participate in the fixing of rates, for which purpose the assistance of the companies shall be requested, and it may exercise the right of initiative in those cases to which reference is made in article 77.

(2) To administer the general railroad fund in conformity with this law and the regulations for its enforcement.

(3) To decide all claims that the companies or public may present regarding the decisions of the inspection.

⁵ Modified by decree law, No 684, art. (g).

(c) To participate in the fixing of rates for water transportation and the movements within the ports.

(d) To decide disputes arising between the companies on the application of this law in all matters relating to transportation in common, or through connecting lines.

(e) To report on all matters relating to public transportation that the Government submits to them for study.

TITLE VII.—GENERAL RAILROAD FUND

ART. 115. The general railroad fund will be made up of—

(a) The quotas that the companies shall contribute, in accordance with provisions of article 56 of this law.

(b) The surplus revenues as established in articles 26 and 77.

(c) The revenues from leases that may have been paid for State-owned railroads delivered over to private parties for operation.

(d) Amounts that the companies that enjoy an interest guaranty must pledge in order to reimburse the amounts that the State may have paid on account of such guaranty.

(e) The revenues derived from leasing of State lands delivered over to the use of the railroad companies.

(f) Fines that the companies and other persons may have incurred for infraction of this law or its by-laws.

(g) The amounts that the railroad concessionaire shall have to pay on being granted the concession, extension of time, or authorization for transferring or ceding the concession granted to them.

(h) The guaranty deposits ordered confiscated for nonfulfillment of the obligations pledged by them.

(i) The setting aside of 10 per cent of the amount of the concession transfer, and any other sums, as designated in article 22.

(j) The amount of cash derived from the sale of unclaimed articles, to which reference is made in article 98.

(k) The fees collected for examination tests and daybooks given to machinists and other employees of the technical division of the railroad.

(l) The subsidies that may be granted by the general budget law and by special laws.

(m) Contributions from private individuals.

(n) Interest derived from the preceding items.

ART. 116. The general railroad fund shall be used—

(a) To pay salaries and other expenses of the offices of the inspection and of the council.

(b) To pay for, or subsidize the instruction of machinists, signalmen, or other employees of the technical division of the railroad.

(c) To assist in the construction of supplementary work or the acquisition of new equipment by means of loans made to the companies at 6 per cent annual interest with 2 per cent annual cumulative amortization.

(d) To encourage the construction of railroads for public use by means of loans made to contractors, provided that the railroad requesting such aid is declared to be of national or regional interest by decree of the President of the Republic.

With the railroad line itself as guaranty, the loans referred to in the preceding paragraph shall be granted without interest payments for the first five years, and at 6 per cent interest, with 2 per cent cumulative amortization, beginning with the sixth year.

These loans shall be granted to isolated or branch lines, a gage different from that of connecting lines and only when such lines reach 30 kilometers in length.

The council may grant this exemption preferably to those companies most patronized by the people, by means of a subsidy paid into the general railroad fund of not less than one-third of the amount of the loan requested by the contractor.

ART. 117. In conformity with this law, the council may administer as private property such surpluses of the general fund as are left over after paying their own expenses and those of the inspection.

The budget of receipts and expenditures shall be kept separate from the general national budget, and submitted for the approval of the President of the Republic before October 15 of the year preceding that which it covers. If the President of the Republic does not approve the budget before January 1, the budget of the preceding year shall provisionally operate.

ART. 118. As regards financing, participation, and rendition of accounts, the accounts of the service shall be subject to the provisions of the laws of January 20, 1883, and September 16, 1884, in so far as they appertain to the general accounting division and court of accounts.

ART. 119. The investment account shall be submitted annually for the consideration of the court of accounts, and shall be presented to the congress for examination and approval.

ART. 120. The moneys that are not immediately used, shall remain invested in such securities as the council may determine, with the approval of the President of the Republic.

ART. 121. The members of the council shall be responsible for their mandatories.

TITLE VIII.—PROVISIONS FOR PENALTIES

CHAPTER 1.—*Transgressions and crimes against the safety of the railroads*

ART. 122. Anyone wilfully destroying or damaging the railroad line, or placing obstacles on it that might cause derailment, or in any other manner endeavor to bring this about, shall be punished with minor imprisonment ranging between the minimum and mean degrees.

ART. 123. If, through the destruction, derangement, or obstacles wilfully placed on the tracks, or any other act committed, derailment occurs, the guilty person shall be punished with minor imprisonment ranging between the mean and maximum limits.

ART. 124. If, in consequence of the accident caused by the acts just referred to, death ensues of any person or persons on the train, the guilty party shall be punished with the penalty indicated for willful manslaughter.

ART. 125. If the accident causes merely the wounding or any other injury to persons, the guilty party, in addition to the penalty indicated in article 123, shall suffer such other punishment as is provided for in the case of injuries or damages caused.

ART. 126. The perpetrator of the acts that may have caused the accident, is not only obligated to indemnify the railroad for losses that the railroad may sustain, but persons on the train as well.

ART. 127. A verbal or written threat to commit any of the crimes referred to in article 122, shall be punishable with imprisonment and a fine of from 50 to 500 pesos.

ART. 128. If the crimes referred to in article 122 are committed in times of strikes, insurrection, or sedition, the penalty indicated in the preceding articles shall be doubled.

ART. 129. Anyone who through ignorance, imprudence, carelessness, or failure to comply with the railroad regulations involuntarily causes accidents that may result in injury or damage to persons, shall suffer the penalty of minor imprisonment in minimum degree, and be fined 50 to 500 pesos, without prejudice to indemnification for damage caused.

ART. 130. If the accident not wilfully brought about should result in the death of any person, the guilty party shall suffer the penalty of minor imprisonment ranging from the mean to the maximum degree.

In case no one is killed or wounded, the penalty will be arrest and a fine of from 50 to 500 pesos, without prejudice to indemnification for the damage caused.

ART. 131. The engineer, conductor, or brakeman who leaves his post while on duty, or attends to his duties while drunk, shall be punished with minor imprisonment ranging from minimum to mean degree, and a fine of from 50 to 500 pesos.

ART. 132. If, in consequence of leaving his post of duty, or getting drunk, accidents occur that may result in or cause the death of any person, the guilty party shall incur the penalty of minor imprisonment in maximum degree, and a fine of from 50 to 500 pesos.

ART. 133. If such abandonment of duty, or getting drunk, is done with criminal intent and results in injury to persons on the train, the engineer, conductor, or brakeman shall suffer the penalties indicated in articles 122, 123, 124, 125, 126, and 128 according to the case.

ART. 134. According to the case, the penalties indicated in the three preceding articles, shall apply to any other railroad employee who, charged with a duty to perform, abandons it or attends to it while drunk.

ART. 135. Anyone who intentionally cuts the electric wires used by the railroad, uproot or destroy the posts, or commit any other act tending to interrupt communication, shall be punished with minor imprisonment in its minimum degree.

If such act results in a train accident, the punishment shall be minor imprisonment of mean degree.

If injury result to any person from such accident, the punishment shall be minor imprisonment in maximum degree; and lastly, if the death of anyone results therefrom, the punishment shall be major imprisonment for a period of from 5 to 10 years.

ART. 136. Any attack upon, or violent resistance to the railroad agents or employees engaged in the discharge of their duties, shall be punished by imprisonment and a fine of from 50 to 500 pesos.

ART. 137. The conductor of the train is responsible for its safe convoy, and is entitled to demand of all passengers the observance of the respective rules.

He may ask any person who disturbs the peace and order, to leave the coach or cars of the train, in conformity with the regulations.

ART. 138. If any crime is committed on the train during the journey, the conductor shall take the necessary measures to seize the delinquent until the nearest station is reached, where, without delay, the delinquent shall be placed at the disposal of the competent judge; the conductor shall furnish a detailed report of the occurrence, specifying the persons who shall appear as witnesses, or those who may have knowledge of the crime.

ART. 139. Within the precincts of the station, the station master shall exercise the same powers as those held by the train conductor while the train is in motion.

ART. 140. The station master as well as the train conductors and other employees whose duty it is to see to the safe convoy, are entitled to request the aid of the authorities and police agents to enforce the rules regarding safe convoy, and to assist them in bringing under competent authority any transgressors of these rules.

ART. 141. Anyone who attempts to resist the demands or summons of the station master, train conductors, or other employees charged with the safety of convoy and observance of the regulations for safety and order, shall, in addition to the punishment for violation of the law, suffer punishment by imprisonment and a fine of from 50 to 500 pesos, without prejudice to the punishment incurred for acts committed against the station master, conductor, or employee who may have summoned him.

ART. 142. Infractions of this law, committed with criminal intent, and carrying no specifically indicated penalty, shall be punished with minor imprisonment in maximum degree, and a fine of from 50 to 3,000 pesos, when reported by the inspectors, passengers, or upon the request of the Department of Justice.

ART. 143. The service of special guards for stations, workshops, tracks, and trains in motion, shall be subject to the regulations issued by the President of the Republic.

In this regulation, fines may be fixed up to 200 pesos.

ART. 144. The sworn statement of the employee charged with the safety of convoy, regarding crimes committed against such safety at the place or spot where he is on duty, will be accepted in good faith, unless proven to the contrary.

CHAPTER 2.—*Offenses on the part of the railroad companies*

ART. 145. The railroad companies are responsible for any acts or omissions contrary to this law, and can not shift this responsibility to their employees.

ART. 146. Any infraction for which no specific penalty is stated in this law, shall be punished with a fine of from 50 to 500 pesos.

Each and every day that may pass without conforming to the provisions of the law or regulations, after orders to that effect shall have been received from the Inspection, shall be considered a separate infraction.

TITLE IX.—MISCELLANEOUS PROVISIONS

ART. 147. Railroad companies to whom concessions may have been granted during the last 10 years, may request that the original concession be replaced by a new one conforming to the provisions of this law.

ART. 148. The railroad law of August 6, 1862, and Title II of decree law No. 160 of December 18, 1924, and other provisions of the same decree law, are hereby repealed, in so far as they are contrary to the present law.

ART. 150. The Secretary of State of the department of public works and highways is authorized to invest an amount up to 200,000 pesos for the installation and initial operation of the transportation services created by this law, taking such sums out of the general revenues.

ART. 151. This law shall be in force from the date of its publication in the *Diario Oficial*.

Let measures be taken for registering and communicating this decree law, and publishing it in the *Bulletin of Government Laws and Decrees*.

EMILIO BELLO C.

C. A. WARD A.

PEDRO P. DARTNELL E.

F. MARDONES.

MINISTRY OF PUBLIC WORKS, COMMERCE TRANSPORTATION

DECREE LAW NO. 684

SANTIAGO, *October 17, 1925.*

No. 684. The Vice President of the Republic, in agreement with the council of ministers, promulgates the following decree law:

ARTICLE 1. In the manner indicated in the following decree law, the provisions of decree law No. 342, of March 13, 1925, have been modified and additions made thereto.

ART. 2. Articles 28 and 29 are replaced by the following:

ART. 28. Whenever the President of the Republic deems it necessary, upon the proposal of the council, to expropriate a railway, he shall request from the national congress the enactment of the law authorizing the expropriation in the manner provided for by the constitution and the law granting the necessary funds to pay the amount determined by mutual agreement or by expert appraisal as specified in this article. For the expropriation there shall be paid an amount, expertly appraised, representing the installations of properties, and rights of every nature constituting the totality of the enterprise, including the commercial value of it as an established business, and deducting the part of the capital that may have been amortized.

If expropriation is effected before the expiration of 10 years, reckoned from the date of the granting of the concession, the appraised value shall be paid increased by 20 per cent, and by 10 per cent if the expropriation is effected within the 10 years following.

The commission of experts shall be composed of three expert engineers, appointed, one by the President of the Republic, another by the concessionaire, and the third by the president of the Supreme Court of Justice.

ART. 3. There is inserted after the expression "the concessionaire," in section 1 of article 16, the following: "Of railway lines intended for public service."

ART. 4. There is added to section (a) of article 48, the following phrase: "And the secretaries of both chambers."

ART. 5. Section (c) of the same article is replaced by the following: "The Director General of Public Works, the Director General of the Navy, the Inspector General of the Army, the commander in chief of the active fleet, the chief of staff of the army, and the chief of staff of the navy, the commanders in chief of the military divisions and the chiefs of the naval stations, within the territory of their jurisdiction."

ART. 6. Article 53 is modified as follows: "In case the companies do not enter into the agreements referred to in the preceding article, within the period determined by the inspection, the services shall be performed in the manner specified by the inspection, while the Government, after having heard the council, and the latter, those interested, adopts a definite resolution.

"The companies are obligated to respect the resolutions which, in such cases, are adopted by the Government, without losing the right to take their claims before the ordinary courts.

"The regulations shall determine the method and the delays by which such claims are to be settled."

ART. 7. The final sentence of section 2 of article 77, "the council shall have the right," is replaced by the following: "The Government and the council shall have the right."

Section 3 is replaced by the following: "The council may come to agreement with the company regarding decreases of rates deemed proper, provided that the gross customs receipts are not reduced by more than 0.5 per cent, under the limit indicated in the present article."

To the same article are added the following two final sections: "The immobilized capital of each company shall be determined by the President of the Republic, after hearing the council. The rates and their modifications of the state and

private railway lines shall be submitted to the decision and approval of the Government, without which prerequisite they may not enter into force."

ART. 8. Section 5 of article 104 is replaced by the following: "To study and to submit for the consideration of the council the determination of the capital of each company."

ART. 9. Paragraph 1 of article 114 is replaced by the following: "To participate in the fixing of the rates, for which purpose the council shall present to the Government the request of the companies regarding the particular matter, and may exercise the right of initiative in the cases referred to in article 77."

ART. 10. The following articles are added:

"ART. 151. Questions that may arise in the determination of the amount of the shares and other dues and obligations which the companies or the concessionaires must pay, according to the present law, shall be settled by the superior railway inspection. On the basis of this decision, the chief inspector shall effect the settlement of what is owed and formulate the respective collection.

"ART. 152. If the company or the concessionaire does not make payment within 10 days following the date of the decision, the inspection may have recourse to civil court and request an embargo writ.

"ART. 153. The liquidation (settlement) referred to in article 151, signed by the chief inspector, shall, in itself, have sufficient executive force, and in the decision no other exception shall be admissible but that of payment, credited by the deposit certificate of the amount owed, in the fiscal treasury of Santiago, to the order of council of transportation.

"ART. 154. The method stated in the two preceding articles is applicable as well to the payment of the fines imposed by the inspection and not paid within 10 days following the date when the decision as to fines is rendered.

"A copy of this decision, signed by the inspector, shall have executive force.

"ART. 155. Judicial representation of the council of transportation and of the superior railway inspection rests with the chief inspector who may delegate this right to officials under him.

"ART. 156. The superior railway inspection shall carry on the legal proceedings on common (ordinary) paper and be exempt from payment of the fees fixed in the judicial schedules and in the laws regarding stamp tax and sealed papers."

ART. 11. The decree law, No. 692, of this same date, is hereby annulled.

ART. 12. The present decree law shall govern from the date of its publication in *Diario Oficial*.

Have steps taken for registering, publishing, and inserting this in the *Leges y Decretas del Gavierno* (Government Laws and Decrees).

(S) LUIS BARROS BARGANO.
To GARCIA CASTELBLANCO.

Appendix B.—IMPORTS OF RAILWAY EQUIPMENT
IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN
 [Weight in gross kilos; value in pesos of 6d.]
LOCOMOTIVES AND TENDERS

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Argentina.....	6,000	21,066	13,000	36,000	3,250	3,690	76,245	102,000				
Belgium.....			42,545	50,238	131,800	195,000						
Bolivia.....							29,036	107,538	370,547	1,740,114	65,040	65,493
Germany.....							308,665	1,928,730	1,259,904	132,663	1,050,507	
Great Britain.....	73,820	238,833	373,096	1,566,066	34,705	100,929						
Netherlands.....												
Italy.....												
Panama.....	1,014,047	663,915										
Peru.....												
Sweden.....			11,955	68,082								
United States.....	1,684,641	4,192,200	449,207	1,800,430	2,784,566	12,043,680	1,452,326	5,717,688	217,203	1,431,843	3,202,697	9,856,782
Total.....	2,778,508	5,116,014	889,803	3,520,836	2,954,321	12,403,299	1,866,272	7,855,956	758,922	4,431,861	3,400,400	10,972,782

ELECTRIC LOCOMOTIVES AND PARTS												
Germany.....												
Great Britain.....												
United States.....												
Total.....												

SPRINGS FOR LOCOMOTIVES AND TENDERS												
Argentina.....	260	699										
Belgium.....												
Germany.....												
Great Britain.....	9,783	56,235	29,572	98,448	5,459	25,674	1,919	3,531	9,058	48,018	10,810	35,934
Netherlands.....							21,484	96,828	37,696	255,171	18,817	5,073
Switzerland.....												127,653
United States.....	2,327	11,058	3,979	15,090	1,086	4,263	14,068	24,972	8,894	31,764	425,534	466,491
Total.....	12,370	67,992	33,551	113,538	6,545	29,937	37,471	125,331	55,648	334,953	456,548	635,151

IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN—Continued

FREIGHT CARS

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Argentina.....							214, 280	230, 400	107, 650	47, 100	1, 228	8, 700
Belgium.....									274, 236	1, 387, 230		
Bolivia.....					144, 713	146, 250						
France.....							51, 717	7, 080	128, 672	1, 098, 546		
Germany.....	9, 408	21, 027	1, 609	16, 101			12, 714	36, 000	17, 057	71, 337		
Great Britain.....												
Netherlands.....												
Panama.....	1, 422, 281	636, 216										
United States.....	3, 163, 438	2, 397, 441	1, 306, 439	1, 934, 235	22, 381	52, 683	1, 238, 479	1, 704, 267	79, 511	177, 750	5, 223, 962	5, 980, 964
Total.....	4, 595, 127	3, 054, 684	1, 308, 048	1, 950, 336	167, 064	198, 933	1, 517, 190	1, 977, 777	607, 126	2, 781, 963	5, 225, 190	5, 989, 664

PASSENGER CARS

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Germany.....		24, 000								56, 313		
Great Britain.....	5, 261	135, 900	22, 493	51, 441	29, 567	64, 788			5, 893	25, 224	277, 461	608, 400
United States.....	19, 156								2, 228			
Total.....	24, 417	159, 900	22, 493	51, 441	29, 567	64, 788			8, 121	81, 537	277, 461	608, 400

TANK CARS

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Belgium.....												
Great Britain.....									809, 962	1, 444, 905		
Netherlands.....												
United States.....					168, 190	290, 622	285, 029	407, 319	8, 627	2, 160		
Total.....					168, 190	290, 622	285, 029	407, 319	818, 580	1, 447, 065		

MOTOR RAIL CARS

Great Britain	555	3,621	1,899	20,700	5,434 628	109,386 6,990	5,601	66,036
United States	555	3,621	1,899	20,700	5,434 628	109,386 6,990	5,601	66,036
Total	555	3,621	1,899	20,700	6,062	116,376	5,601	66,036

RAILWAY HAND CARS

	Belgium	France	Germany	Great Britain	Netherlands	United States	Total
1970	140	750					
1975	140	750					

CARS FOR PORTABLE AND AERIAL RAILWAYS

[illegible]

TRAMWAYS

	22,800	43,350	47,840	216,000		4,998	1,960	3,000	3,490	15,000	
Argentina-----											
Belgium-----											
Germany-----											
Great Britain-----											
United States-----					672	4,998					
Total -----	22,800	43,350	47,840	216,000	672	4,998	1,960	3,000	3,490	15,000	

IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN—Continued
IRON PARTS FOR RAILWAY CARS

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Belgium.....	93	312							16,877	131,475	27,145	39,492
Bolivia.....												
France.....												
Germany.....							25,921	47,112	52,195	100,800	1,068	243
Great Britain.....	80,748	150,852	161,874	67,482	11,146		17,318	83,145	75,829	303,654	32,032	99,753
Netherlands.....											1,475	717
Panama.....												
Sweden.....												
United States.....	501,041	922,329	565,805	1,281,318	667,783	1,646,562	80,396	125,802	46,497	176,352	58,722	117,507
Total.....	581,882	1,073,493	612,842	1,443,192	678,929	1,714,044	123,635	256,059	191,398	712,281	120,442	257,712

IRON PARTS FOR AERIAL LINE CARS

Belgium.....							53,605	240,375	21,450	63,936	27,765	37,500
Germany.....							33,822	95,172	46,568	186,255	2,500	4,245
Great Britain.....							732	4,956	17,268	35,229	5,182	19,575
United States.....												
Total.....					12,260	42,459	88,686	340,503	85,286	285,420	35,447	61,320

SPRINGS FOR RAILWAY CARS

Argentina.....			7,230	9,000	184	1,389					12,424	13,125
Belgium.....												
France.....									810	7,926		
Germany.....							23,279	46,629	1,082	3,450	39,212	16,167
Great Britain.....	41,390	147,567	50,570	136,308	97,737	359,691	10,403	50,745	41,098	223,704	6,671	15,780
Netherlands.....												
United States.....	6,249	18,246	109,229	173,283	73,337	125,331	9,694	17,103	63,072	120,312	155,114	344,061
Total.....	47,639	165,813	167,029	318,591	171,258	486,411	43,376	114,477	106,062	355,392	213,421	389,136

RAILWAY WHEELS

Argentina.....	5, 401	11, 103	402	540	-----	-----	1, 750	5, 970	91, 880	410, 643	396, 250	664, 362
Belgium.....	4, 300	2, 292	-----	-----	-----	-----	13, 080	42, 000	-----	-----	-----	-----
Bolivia.....	4, 421	4, 050	-----	-----	-----	-----	5, 824	6, 870	-----	-----	-----	-----
Czechoslovakia.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
France.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Germany.....	395, 990	397, 077	426, 851	692, 955	298, 335	490, 101	108, 507	322, 803	192, 503	312, 816	53, 596	71, 208
Great Britain.....	-----	-----	-----	-----	-----	-----	292, 089	703, 815	594, 873	1, 169, 364	158, 587	313, 092
Peru.....	-----	-----	-----	-----	-----	-----	280	1, 140	-----	-----	-----	-----
Netherlands.....	-----	-----	-----	-----	-----	-----	9, 010	49, 575	221, 122	138, 156	-----	-----
Spain.....	-----	-----	-----	-----	-----	-----	2, 562	6, 600	-----	-----	-----	-----
United States.....	1, 288, 523	1, 397, 919	780, 246	1, 405, 926	947, 807	1, 874, 559	614, 147	980, 385	1, 225, 542	1, 768, 008	1, 374, 933	1, 272, 570
Total.....	1, 608, 635	1, 812, 441	1, 207, 589	2, 099, 421	1, 246, 142	2, 364, 660	1, 107, 199	2, 119, 158	2, 235, 920	3, 798, 987	1, 983, 366	2, 321, 232

BUFFERS

Argentina.....	-----	-----	-----	-----	-----	-----	4, 270	4, 320	5, 380	29, 760	14, 406	27, 906
Belgium.....	-----	-----	-----	-----	-----	-----	6, 915	14, 034	1, 780	1, 899	598	1, 575
Germany.....	-----	-----	-----	-----	-----	-----	13, 319	61, 365	29, 452	169, 533	8, 849	60, 498
Great Britain.....	43, 141	89, 085	3, 426	12, 189	39, 219	123, 795	-----	-----	-----	-----	-----	-----
Netherlands.....	-----	-----	-----	-----	-----	-----	21, 209	43, 044	410, 372	382, 563	5, 518	11, 250
United States.....	88, 338	273, 183	208, 932	491, 478	73, 188	235, 638	-----	-----	-----	-----	-----	-----
Total.....	131, 479	362, 268	212, 358	503, 667	112, 407	359, 433	45, 713	129, 363	446, 984	1, 174, 785	29, 371	101, 229

STEEL BOGIES

Argentina.....	-----	-----	-----	-----	-----	-----	-----	-----	2, 865	2, 400	-----	-----
Bolivia.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Germany.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Great Britain.....	64	399	-----	-----	-----	51, 012	-----	-----	18, 720	36, 972	1, 256	7, 020
United States.....	342, 152	479, 808	-----	-----	4, 888	66, 000	-----	-----	-----	-----	-----	-----
Total.....	342, 216	480, 267	-----	-----	42, 888	117, 012	-----	-----	21, 585	39, 372	1, 256	7, 020

IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN—Continued

RAILWAY BRAKES

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Belgium.....												
Bolivia.....												
France.....											4,202	20,496
Germany.....		69,366	42	513			12,795	50,046				
Great Britain.....	31,506	250,176	63,868	214,911	29,703	162,981	26,261	59,433	34,006	209,139	312	1,020
United States.....	79,375										1,964	15,555
Total.....	110,881	319,542	63,910	215,424	29,703	162,981	39,056	109,479	34,006	209,139	6,478	37,071

JOURNAL BOXES

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Argentina.....												
Belgium.....			1,000	4,200	913	2,634						
Bolivia.....							392	624				
Germany.....							11,858	37,299	3,508	13,200	3,835	3,345
Great Britain.....	9,539	23,364	6,153	40,764	25,421	140,316	4,500	22,038	12,240	90,915	974	10,767
Netherlands.....							1,054	17,076				
Sweden.....							6	18				
United States.....	12,434	38,982	21,364	62,865	15,250	51,831	7,846	46,254	5,436	26,040	2,455	4,485
Total.....	21,973	62,346	28,517	107,829	41,584	194,781	25,656	123,909	21,184	130,155	7,264	18,597

CHAIN COUPLINGS

Country	1917		1918		1919		1920		1921		1922	
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value
Belgium.....												
Germany.....							577	972	1,129	1,851		
Great Britain.....					47,058	133,458	10,307	21,972	5,205	17,130		
Peru.....					490	300						
United States.....					71,890	170,178			4,120	7,464	688	1,515
Total.....					119,408	303,936	10,884	22,944	10,454	26,445	688	1,515

RAILWAY RAILS

Argentina.....	69,946	24,888	50,481	28,500	-----	-----	150	120	6,000	3,600	6,840	2,640
Belgium.....	3,020,852	853,404	-----	-----	-----	-----	159,852	53,268	1,314,596	776,892	3,004,755	2,630,559
Bolivia.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Denmark.....	-----	-----	-----	-----	-----	-----	-----	-----	88,110	62,400	799,140	1,395,264
France.....	-----	-----	-----	-----	-----	-----	338,443	235,485	1,398,817	402,834	12,382,572	4,486,434
Germany.....	233,903	132,741	15,240	11,397	298,584	297,987	509,700	833,709	1,517,425	1,326,993	413,289	303,723
Great Britain.....	-----	-----	-----	-----	-----	-----	-----	-----	366,670	86,544	113,495	63,471
Netherlands.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Italy.....	13,520,794	7,990,119	7,120,831	3,899,139	11,662,155	8,073,858	5,941,090	3,512,325	6,399,747	4,117,593	5,390,418	2,576,130
United States.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total.....	16,845,495	9,001,152	7,186,552	3,939,036	11,990,739	8,371,845	6,949,235	4,634,907	11,091,365	6,776,856	22,110,509	11,458,230

SPECIAL RAIL SPIKES

Argentina.....	1,014	1,086	15,334	15,840	10,575	33,600	82,300	202,689	120,323	312,543	2,253	2,370
Belgium.....	10,564	750	-----	-----	-----	-----	3,650	10,920	21,081	18,828	55,625	106,930
Bolivia.....	-----	-----	-----	-----	-----	-----	48,685	104,005	50,362	79,041	603,022	399,984
France.....	-----	-----	-----	-----	-----	-----	180,987	292,962	50,362	79,041	40,062	40,998
Germany.....	92,952	103,956	218,560	288,456	139,927	178,518	18,900	159,951	391,765	527,304	37,474	21,438
Great Britain.....	-----	-----	-----	-----	-----	-----	240,656	173,463	-----	-----	-----	-----
Netherlands.....	570,413	435,231	352,076	516,258	778,881	1,024,140	-----	-----	-----	-----	-----	-----
United States.....	-----	-----	-----	-----	-----	-----	575,178	948,990	583,531	937,713	738,436	570,720
Total.....	674,943	541,023	585,970	820,554	929,383	1,236,258	-----	-----	-----	-----	-----	-----

RAILWAY TURNTABLES

Argentina.....	-----	-----	9,000	6,000	-----	-----	-----	-----	-----	-----	-----	-----
Belgium.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bolivia.....	-----	-----	-----	-----	-----	-----	3,060	4,362	5,123	19,170	14,754	51,132
France.....	-----	-----	-----	-----	-----	-----	-----	-----	15,692	28,212	40,380	54,324
Germany.....	7,308	5,820	-----	-----	-----	-----	4,645	5,250	5,796	21,798	-----	-----
Great Britain.....	118,401	285,558	2,177	4,815	6,743	12,645	-----	-----	-----	-----	-----	-----
Netherlands.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
United States.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total.....	125,709	291,378	11,177	10,815	6,743	12,645	7,705	9,612	26,611	69,180	55,134	105,456

RAILWAY CROSS TIES

Belgium.....	---	---	---	---	---	23,900	14,820	1,055	3,000	44,860	261,000
Germany.....	---	---	---	---	---	53,904	90,615	48,328	44,100	30,471	28,815
Great Britain.....	---	---	---	---	---	---	---	---	---	49,200	8,010
Peru.....	---	---	---	---	---	---	---	---	---	---	---
United States.....	337,416	233,400	49,808	35,517	75,291	31,829	23,349	90,307	76,029	---	---
Total.....	337,416	233,400	49,808	35,517	75,291	109,633	128,784	139,690	123,129	124,531	297,825

SWITCHES

Argentina.....	---	---	---	---	36	17	1,650	---	---	---	---
Belgium.....	---	---	---	---	---	6,000	3,525	---	---	152,853	252,000
Bolivia.....	2,240	393	---	---	---	---	---	---	---	---	---
France.....	---	---	---	---	---	---	---	---	---	---	---
Germany.....	---	---	---	---	---	39,152	74,694	6,639	8,388	26,426	15,546
Great Britain.....	4,715	6,480	---	---	---	57,076	92,487	372,136	581,922	44,953	50,289
Netherlands.....	---	---	---	---	87,873	7,983	2,859	13,946	7,440	---	---
Panama.....	32,371	41,530	---	---	---	---	---	---	---	---	---
United States.....	191,927	332,802	177,194	252,299	67,157	159,910	185,181	172,570	209,667	22,218	31,266
Total.....	231,253	381,225	177,194	252,299	155,066	270,138	360,396	565,291	867,417	246,450	349,101

OTHER RAILWAY MATERIAL AND TOOLS

Argentina.....	---	---	---	---	---	---	---	---	---	---	---
Belgium.....	---	---	---	---	---	---	---	---	---	---	---
Bolivia.....	---	---	---	---	---	---	---	---	---	---	---
Denmark.....	---	---	---	---	---	---	---	---	---	---	---
France.....	---	---	---	---	---	---	---	---	---	---	---
Germany.....	---	---	---	---	---	---	---	---	---	---	---
Great Britain.....	153,308	145,689	8,364	15,225	187,961	12,756	14,985	38,991	155,634	39,373	109,644
Netherlands.....	---	---	---	---	---	---	---	---	---	---	---
Sweden.....	---	---	---	---	---	---	---	---	---	---	---
United States.....	2,454,663	1,525,842	25,710	18,684	2,309,954	152,726	496,497	1,769,494	2,648,451	288,205	802,695
Total.....	2,607,971	1,671,531	40,019	39,315	2,497,915	318,609	1,434,054	2,209,573	5,169,624	868,021	2,083,659

IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN—Continued

[Weight in gross kilos; value in pesos of 6d.]

LOCOMOTIVES AND TENDERS

Country	1923		1924 ¹		1925		1926		1927 ²		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Argentina.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	60,750
Belgium.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	142,188
Bolivia.....	133,539	180,000	.....	.....	.....	.....	1,015	2,065	6,343	37,523	425,238
Germany.....	138,036	323,070	.....	.....	.....	.....	.....	.....	.....	.....	4,685,285
Great Britain.....	191,867	840,225	359,802	730,146	177,151	406,236	180,883	544,148	187,911	707,610	17,918,434
Netherlands.....	.....	.....	916,200	3,147,130	429,675	1,610,556	818,325	3,317,036	924,403	2,708,508	86,527
Italy.....	.....	.....	.....	.....	.....	.....	.....	.....	35,570	86,527	9,123
Panama.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	603,915
Peru.....	.....	.....	18,000	69,900	.....	.....	.....	.....	.....	.....	69,900
Sweden.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	106,941
United States.....	7,440,139	28,949,631	155,084	806,889	2,606,006	6,738,261	1,053,714	1,923,708	56,589	313,044	73,834,256
Total.....	7,913,572	30,293,826	1,449,206	4,814,085	3,306,852	8,764,176	2,660,494	5,826,466	1,210,876	4,003,242	98,002,543

ELECTRIC LOCOMOTIVES AND PARTS

Country	1923		1924 ¹		1925		1926		1927 ²		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Germany.....	3,500,501
Great Britain.....	3,380,522
United States.....	3,12,036,116
Total.....	3,13,010,139

SPRINGS FOR LOCOMOTIVES AND TENDERS

Country	1923		1924 ¹		1925		1926		1927 ²		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Argentina.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	690
Belgium.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37,104
Germany.....	36	1,260	.....	.....	.....	.....	.....	.....	.....	.....	143,532
Great Britain.....	938	1,791	.....	.....	.....	.....	.....	.....	.....	.....	857,320
Netherlands.....	3,220	9,660	.....	.....	.....	.....	.....	.....	.....	.....	1,325
Switzerland.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	674,806
United States.....	4,878	14,940	70,916	53,365	14,647	25,968	5,785	10,215	1,187	16,730	1,715,444
Total.....	9,081	27,651	94,701	110,787	94,956	144,786	19,048	54,503	29,083	70,815	1,715,444

FREIGHT CARS

Argentina.....	1,389,666	6,932,385	540	1,002	501,800	185,000	2,316,200	2,274,918	581,681	529,210	451,200
Belgium.....					1,430,864	1,217,787					12,342,532
Bolivia.....											146,250
France.....					15,261	28,500					28,500
Germany.....	166,042	175,707	331,568	210,429	2,305,479	2,008,080	814,131	727,518	96,998	42,173	4,329,533
Great Britain.....	67,713	141,555	739	3,708	2,549,410	3,374,076	1,082,815	1,185,533	942,632	833,760	5,683,097
Netherlands.....					116,567	100,335	62,129	136,845	109,841	133,532	370,712
Panama.....											636,216
United States.....	1,477,923	1,597,152	2,644,948	3,695,643	3,053,025	3,571,227	5,007,277	5,270,474	3,352,994	4,304,667	30,686,533
Total.....	3,101,344	8,846,799	2,977,795	3,910,782	10,272,406	10,525,005	9,282,552	9,585,288	5,084,146	5,843,342	54,674,573

PASSENGER CARS

Germany.....	5,086	3,987	2,979,997	7,649,742			461,306	1,991,148	90,401	530,320	7,653,729
Great Britain.....							105,750	585,161			2,601,781
United States.....			131	498							1,471,412
Total.....	5,086	3,987	2,980,128	7,650,240			567,086	2,576,309	90,401	530,320	11,726,922

TANK CARS

Belgium.....	48,990	67,500			42,519	92,160					1,512,405
Great Britain.....											92,160
Netherlands.....	21,590	68,463	4,682	6,249	143,389	218,571					2,160
United States.....											991,224
Total.....	70,580	135,963	4,682	6,249	185,908	310,731					2,597,949

MOTOR RAIL CARS

Great Britain.....	6,858	89,784	10,554	88,251	8,330	103,266	2,825	2,900	1,370	22,972	479,695
United States.....	15	249	15	363	13	237			4,801	26,907	61,967
Total.....	6,873	90,033	10,569	88,614	8,343	103,503	2,825	2,900	6,171	49,879	541,662

¹ Statistics include steam locomotives and tenders and electric locomotives up to and including 1923.

² Total for the four years 1924, 1925, 1926, and 1927 only.

³ Includes steam locomotive parts.

IRON PARTS FOR RAILWAY CARS

Belgium.....	165,510	456,858	44,873	87,525	442,400	586,074	35,078	38,766	265,159	312,267	1,652,457
Bolivia.....							740	783			1,095
France.....					458	1,380					1,380
Germany.....	3,550	24,882	219,732	191,007	4,129	19,164	12,844	33,557	28,875	57,401	474,766
Great Britain.....	16,883	30,726	536,262	421,032	45,154	96,537	115,341	123,515	1,522,417	1,386,827	2,925,397
Netherlands.....									49,636	41,223	41,940
Panama.....									57	230	230
Sweden.....			389	2,361			138	3,357			5,718
United States.....	288,301	500,808	286,039	453,300	1,027,219	999,735	480,740	563,897	245,057	614,090	7,401,700
Total.....	474,244	1,013,274	887,295	1,155,825	1,519,360	1,702,890	644,881	763,875	2,111,201	2,412,038	12,504,681

IRON PARTS FOR AERIAL LINE CARS

Belgium.....							114,716	116,769			154,269
Germany.....	323	336	10,238	15,096	14,960	37,017	500	250			361,255
Great Britain.....	14,561	21,825	6,709	13,425	1,292	4,119	11,035	86,739			468,837
United States.....	669	2,613			16,454	74,343					117,873
Total.....	15,553	24,774	16,947	28,521	32,706	115,479	126,251	203,758			1,102,234

SPRINGS FOR RAILWAY CARS

Argentina.....											10,389
Belgium.....	46,051	49,491	47,885	79,830	79,428	133,986	8,515	13,416	60,362	79,792	369,640
France.....					2,075	6,750					14,676
Germany.....	22,288	23,940	11,844	26,802	17,989	21,516	102,214	168,253	71,009	46,329	353,086
Great Britain.....	13,140	119,724	37,582	80,052	40,562	92,904	17,759	49,069	32,604	55,565	1,331,109
Netherlands.....			6,800	5,700	605	1,851			1,130	2,800	10,351
United States.....	41,832	79,662	31,928	45,756	15,321	17,709	100,633	141,793	20,176	17,830	1,101,089
Total.....	123,311	272,817	136,039	238,149	155,980	274,716	229,121	372,531	185,281	202,316	3,190,340

IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN—Continued

RAILWAY WHEELS

Country	1923		1924		1925		1926		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Argentina.....	450	2,100	2,384,917	2,411,613	1,780,627	1,848,666	916,288	970,673	19,713
Belgium.....	612,405	407,013	1,342	7,023	1,232	4,446			7,209,524
Bolivia.....									22,389
Czechoslovakia.....	1,433	960							960
France.....			375	600					600
Germany.....	348,843	214,974	527,357	325,494	490,524	446,436	370,002	278,839	2,016,578
Great Britain.....	272,035	394,640	398,956	636,216	379,477	468,969	144,478	272,816	6,251,933
Peru.....									1,140
Netherlands.....			184,550	67,788	105,445	50,976	73,510	57,556	395,653
Spain.....									6,600
United States.....	184,070	322,248	825,512	780,921	746,145	849,117	1,334,895	1,281,649	12,812,193
Total.....	1,419,236	1,341,975	4,323,009	4,220,655	3,503,450	3,668,610	2,839,773	2,861,523	28,797,283

BUFFERS

Country	1923		1924		1925		1926		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Argentina.....	580	2,400	217,292	666,621	78,604	106,080	92,690	135,025	2,400
Belgium.....	16,620	17,697			3,613	10,482	33,766	38,003	1,038,891
Germany.....	35,047	48,243	24,939	28,658					143,922
Great Britain.....	3,546	19,059	3,612	23,511	91,721	143,928	9,749	49,706	766,251
Netherlands.....			1,639	3,732					3,732
United States.....	9,333	25,200			30,584	67,029	224,772	241,879	2,381,031
Total.....	65,186	112,590	247,392	720,522	204,522	327,519	360,977	404,613	4,326,227

STEEL BOGIES

Country	1923		1924		1925		1926		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Argentina.....									2,400
Bolivia.....									51,012
Germany.....	1,655	2,760							2,760
Great Britain.....	63,992	267,390	153,403	554,841			53,133	48,366	92,737
United States.....							24,443	92,480	1,692,889
Total.....	65,647	270,060	153,403	554,841			77,576	140,846	1,841,818

RAILWAY BRAKES

Belgium.....				7,690	49,431	621	7,555	69,990	107,793	185,275
Bolivia.....		204	2,523	119	2,292	214	6,410			11,225
France.....								197	1,200	1,200
Germany.....	334	62	30	80	543	3,996	4,175	6,924	6,792	17,792
Great Britain.....	8,584	25	864	34,345	244,332	52,212	240,184	74,305	197,399	885,090
United States.....	375,897	353,305	998,061	296,658	551,058	306,662	881,213	103,102	381,413	5,555,950
Total.....	384,785	353,596	1,001,478	278,892	847,656	363,705	1,139,537	254,518	694,597	6,656,412

JOURNAL BOXES

Argentina.....										6,834
Belgium.....										150,925
Bolivia.....		10,880	15,657	109,576	119,982	598	5,376	21,472	9,910	624
Germany.....		6,802	8,118	23,814	37,854	6,510	15,104	1,302	5,510	120,430
Great Britain.....	539	23,420	150,339	8,138	22,680	3,163	9,427	2,821	11,611	523,202
Netherlands.....						347	560			18,236
Sweden.....										18
United States.....	4,099	30,084	85,115	8,674	11,067	939	4,369	21,265	75,076	424,565
Total.....	4,638	71,246	257,229	130,222	191,583	11,557	34,836	46,890	102,107	1,244,834

CHAIN COUPLINGS

Belgium.....		6,532	7,011	95,213	293,640	14,490	5,126			305,777
Germany.....	396	300		8,025	6,468			11,954	11,107	20,698
Great Britain.....	8,950	5,298	8,676	4,116	3,195	109	222	22,503	20,479	215,887
Peru.....										300
United States.....	900	3,189	1,479	1,028	2,184	8,321	12,780	12,397	41,134	238,594
Total.....	10,246	15,019	17,166	108,382	305,487	22,920	18,128	46,854	72,720	781,256

IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN—Continued

RAILWAY RAILS

Country	1923		1924		1925		1926		1927		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Argentina.....	4,204,571	3,887,229	9,369,815	11,079,657	6,770,317	2,751,924	8,528,423	2,248,601	8,769	3,490	63,247
Belgium.....									12,316,713	9,384,194	32,812,324
Bolivia.....											853,404
Denmark.....	10,080	1,980	52,362	37,971	139,710	105,260	6,387	2,378	1,540	500	1,543,453
France.....	1,259,874	455,751	3,963,139	1,618,713	1,186,086	412,542	1,705,461	340,712	838,981	547,810	8,500,281
Germany.....	672,469	298,743	8,567,221	2,519,838	631,387	222,753	1,510,779	367,006	2,266,142	796,418	7,111,308
Great Britain.....	186,765	44,739	1,535,401	233,784	1,392,284	420,606	1,480,743	294,127	187,655	124,432	1,267,703
Netherlands.....			30,161	6,585							6,585
Italy.....					3,959,657	2,577,276	3,858,151	1,579,811	5,974,288	1,813,072	39,948,963
United States.....	4,393,921	1,531,746	8,121,282	2,277,894	14,079,441	6,490,461	17,089,944	4,832,635	21,584,079	12,669,916	92,169,668
Total.....	10,727,671	6,220,188	31,669,381	17,774,442							

SPECIAL RAIL SPIKES

Country	1923		1924		1925		1926		1927		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Argentina.....	83,576	117,435	680,894	1,300,767	276,130	285,516	410,597	109,254	416	780	53,676
Belgium.....			14,292	38,442					912,893	1,244,992	3,679,126
Bolivia.....											39,192
France.....			1,906	885							11,775
Germany.....	370,555	222,402	223,835	134,955	170,052	116,964	147,826	56,157	280,259	107,161	1,165,456
Great Britain.....	126,735	128,331	244,220	183,729	174,525	128,895	76,994	38,510	13,661	10,067	1,493,463
Netherlands.....	3,494	2,289	57,050	96,849	41,524	26,721	42,845	20,845	2,572	1,366	308,021
United States.....	166,174	170,967	30,499	27,990	93,744	85,971	204,745	108,735	188,231	91,415	3,182,969
Total.....	750,534	641,424	1,261,715	1,783,587	755,984	644,067	883,006	353,501	1,398,032	1,455,781	9,933,618

RAILWAY TURNTABLES

Argentina.....	23, 805	62, 610	2, 060	4, 440			2, 520	2, 460		6, 000
Belgium.....							25, 636	7, 695		69, 510
Bolivia.....							3, 471	2, 704		7, 695
Germany.....	3, 903	6, 738	5, 221	5, 061	8, 312	4, 530	18, 964	35, 230	5, 961	97, 352
Great Britain.....				5, 697			281	1, 079	11, 063	120, 283
United States.....										353, 952
Total.....	27, 708	69, 348	12, 211	15, 198	8, 312	4, 530	50, 872	49, 168	17, 054	663, 792

SPECIAL SCREWS AND BOLTS FOR RAILWAYS

Belgium.....	47, 554	36, 801	211, 460	564, 603	196, 054	335, 694	54, 949	25, 337	142, 262	305, 415
Bolivia.....		287		777			1, 206	1, 851		1, 373, 801
France.....	75	150	900	1, 320						7, 815
Germany.....	6, 765	7, 602	54, 662	37, 908	92, 853	59, 226	34, 365	32, 319	34, 556	2, 890
Great Britain.....	116, 765	138, 843	380, 703	372, 531	65, 037	82, 524	10, 387	7, 268	200, 814	233, 673
Netherlands.....	485	138	29, 764	23, 460	47, 936	37, 110	3, 335	1, 195	608	1, 394, 784
Sweden.....										62, 853
United States.....	7, 875	9, 828	51, 812	73, 251	46, 822	64, 410	20, 316	9, 277	255, 614	1, 411, 009
Total.....	179, 519	193, 362	729, 588	1, 073, 850	448, 702	578, 964	124, 558	77, 247	635, 119	4, 490, 919

JUNCTION OR BRIDGE PLATES

Argentina.....	1, 339, 313	1, 106, 052	3, 681, 620	7, 685, 214	593, 624	672, 468	877, 884	386, 376	1, 761, 175	3, 639, 431	16, 450
Belgium.....											13, 918, 595
Bolivia.....											123, 234
France.....	122, 926	42, 000	1, 040	68, 655	2, 300	4, 800					48, 795
Germany.....	56, 746	55, 327	137, 713	94, 197	74, 116	43, 296	88, 395	61, 833	210, 906	230, 878	1, 831, 801
Great Britain.....	307, 678	170, 151	740, 741	362, 490	96, 201	50, 232	60, 343	15, 232	194, 360	116, 495	1, 198, 967
Netherlands.....	7, 745	4, 497	71, 671	33, 511	58, 401	43, 104	134, 673	58, 905	5, 602	6, 219	183, 096
Panama.....											30, 000
Sweden.....					31	48					48
United States.....	861, 550	687, 252	749, 069	682, 242	705, 603	560, 634	698, 038	462, 018	254, 049	304, 035	8, 895, 045
Total.....	2, 695, 938	2, 066, 079	5, 426, 526	8, 929, 704	1, 470, 366	1, 374, 582	1, 800, 024	985, 364	2, 426, 182	4, 297, 058	26, 151, 631

IMPORTS OF RAILWAY EQUIPMENT INTO CHILE, 1917-1927, BY COMMODITIES AND COUNTRIES OF ORIGIN—Continued
IRON OR STEEL BEAMS AND TIES

Country	1923		1924 ¹		1925		1926		1927 ²		Total value of imports for 11-year period
	Weight	Value	Weight	Value	Weight	Value	Weight	Value	Weight	Value	
Belgium	16,230	6,210	110,066	180,108	159,803	140,778	98,253	23,078	54,245	85,750	435,924
Germany	5,845	28,527	73,603	71,925	26,563	17,619	43,414	11,326	1,260	430	126,827
Great Britain			96,679	52,998	30,895	19,287	990	400			72,685
Netherlands					7,064	1,620	852,520	250,858	2,805	845	253,323
United States	74,681	45,975	14,662	14,274	2,963	4,989			751,530	180,000	245,238
Total	96,756	80,712	298,010	319,305	227,288	184,293	995,177	285,662	809,840	267,025	1,136,997

RAILWAY CROSS TIES

Belgium											264,000
Germany											87,735
Great Britain											98,625
Peru			115	225							98,225
United States	9,100	45,675					12,605	47,116			511,511
Total	9,100	45,675	115	225			12,605	47,116			902,096

SWITCHES

Argentina											1,950
Belgium	23,357	84,000	91,483	124,260	50,405	37,149	10,861	5,485	2,379	1,152	507,571
Bolivia											393
France			500	1,200							2,400
Germany	1,800	615	56,697	53,250	24,060	24,123	35,687	30,849	2,810	1,200	216,466
Great Britain	29,853	30,588	145,417	126,552	16,481	16,251	6,205	9,201	152,264	8,941	1,191,069
Netherlands			1,603	2,400	15,095	6,714					19,413
Panama											41,550
United States	30,779	40,404	108,893	183,408	225,729	403,872	432,056	423,027	127,517	231,249	2,497,055
Total	85,789	155,667	404,503	491,070	330,770	488,109	484,809	468,562	300,313	379,072	4,477,747

OTHER RAILWAY MATERIAL AND TOOLS

Argentina	298, 676	831, 249	1, 287, 651	2, 276, 715	1, 071	1, 869				41	125	7, 430
Belgium	66	1, 392			242, 478	443, 247	37, 140	205, 948	538, 034			4, 662, 371
Bolivia					829	9, 312	9, 225					19, 929
Denmark												184, 170
France												3, 348
Germany	75, 273	87, 753	1, 549	1, 893	1, 174	1, 455						906, 402
Great Britain	112, 306	562, 983	103, 464	334, 710	39, 111	85, 800	20, 042	6, 100	13, 430			8, 225, 217
Netherlands			689, 181	2, 243, 103	282, 655	525, 240	66, 516	43, 523	117, 882			33, 685
Sweden					776	1, 395		1, 008	2, 300			2, 880
United States	248, 947	958, 860	477, 462	1, 488, 828	755, 982	1, 825, 452	1, 120, 571	410, 822	1, 593, 631			16, 296, 270
Total	735, 268	2, 442, 237	2, 559, 307	6, 345, 249	1, 324, 076	2, 893, 800	1, 237, 400	667, 442	2, 265, 405			30, 341, 712

Appendix C.—RAILWAY STATISTICS

CHILEAN RAILWAY STATISTICS AS OF DECEMBER 31, 1927¹

Names of railways	Mileage		Total length of line according to gauge						Capital		Locomotives and rolling stock owned						
	Main track	Sidings and branch lines	Total	0.60	0.75	0.762	1.00	1.097	1.435	1.676	Nationality	Investment in pesos of 64.	Loco-motives	Passenger cars	Auto-rail cars	Freight cars	Total
FERROCARRILES DEL ESTADO (STATE RAILWAYS)	Kilo-meters	Kilo-meters	Kilo-meters	Kilo-meters	Kilo-meters	Kilo-meters	Kilo-meters	Kilo-meters	Kilo-meters	Kilo-meters	Chilean	149,444,888	40	22	5	361	388
Arica á la Paz 2	439.50	20.50	460.00				460.00				do	122,220,000	40	34	6	284	324
Longitudinal Norte	713.43	29.18	742.61				742.61				do	154,295,520	125	97	26	1,143	1,265
Red Central Norte	1,738.95	121.92	1,860.77				1,860.77				do	803,288,240	3,656	564	39	7,517	8,110
Red Central Sur	2,800.18	673.47	3,463.65								do	8,778,648	6	9	5	34	48
Puente Alto al Volcan	(3.94	4.65	(8.59														
FERROCARRILES PARTICULARES (INDEPENDENT RAILWAYS)																	
Arica á Tacna	60.80	4.70	65.50						65.50		British	18,520,708	7	8	7	52	67
Junin	90.00	18.28	108.28								Chilean	11,063,381	11	5		406	501
Coleta Buena á Agua Santa	144.93	33.25	178.18								do	24,000,000	19	11	2	1,026	1,039
Salitres de Tarapaca	645.69	107.75	753.41								British	156,630,819	73	44	3	1,709	1,756
Tecopilla al Toco	210.53	29.20	239.73								do	74,976,120	23	9	1	729	739
Antofagasta á Bolivia	833.38	184.07	1,017.45								do	334,483,748	115	175	9	2,774	2,958
Chiriquinima	51.00	8.00	59.00								North American	44,657,754	57			741	741
Coleta Coloso á Agmas Blancas	265.65	16.23	281.88								Chilean	44,666,856	17	9		516	525
Taltal	286.41	41.07	327.48								British	54,456,762	40	18		965	983
Pueblo Humido á Pofretillos	97.02	8.24	105.26								North American	30,608,419	10	5	7	92	104
Caldera á Algarrobo	39.00		39.00								Chilean	50,000	2	2		38	40
Transandino por Maipo	70.79	7.47	78.26								British	82,612,653	9	11		126	137
Llano de Maipo	21.60	2.00	23.60								Chilean	4,060,776	6	9		30	36
Mellipilla á Huacacho	28.00	1.60	29.60								do	2,158,558	3	1	4	14	19

[illegible]

¹ The data shown in this table are as indicated in the *Estadística de los Ferrocarriles en Explotación* al año 1927. No attempt has been made to set them up in accordance with the text of this handbook, as it was thought advisable in this compilation to conform with the railway statistics published by the Chilean Government. The capital investment in the railway system of Chile differs from that used in the text which, because of comparative data for a period of years, was taken from the *Anuario Estadístico de la República de Chile*.

² Including Bolivian section.

³ Includes 37 electric locomotives.

* Track being converted to 1-meter gage throughout.

Taken from the Anuario Estadístico de la Republica de Chile 1926

* Includes 3 electric locomotives

Estadística Anual de la República de Chile 1907

Establishment

Appendix D.—CHARACTERISTICS OF LOCOMOTIVES USED BY CENTRAL SYSTEM (NORTHERN AND SOUTHERN SECTIONS) OF CHILEAN STATE RAILWAYS

LOCOMOTIVES OF 1.676-METER GAGE

[NOTE.—In the service column the letters indicate as follows: A, yard; C, freight; P, passenger; and E, special]

Wheel arrangement	Manufacturer	Weight			Diameter driving wheels	Cylinders	Heating surface	Grate area	Service	Number		
		Total	Locomotive	Tender						Active	Obsolete or knocked down	Total
0-4-0	Hawthorn	Tons 27	27	18.5	Meters 1.524	Multi-419 by 610	Square meters 80	1.21	A	1	—	1
4-4-0	Hawthorn-Slaughter	37	24	27	1.676	457 by 610	106	1.49	P	1	—	1
0-4-4	Slaughter	37	24	27	1.676	457 by 610	106	1.49	P	—	—	—
4-4-0	Rogers	16.4	12.9	No.	0.927	444 by 336	21	0.66	E	1	—	1
4-4-0	Maestranza First Zone	40.2	26.5	26	1.676	457 by 610	102	—	P	—	—	—
4-4-0	Baldwin	36	22.5	26.5	1.676	381 by 610	—	—	P	1	9	1
4-4-0	Rogers	34.9	21.7	23.7	1.676	381 by 610	—	—	P	—	—	—
2-6-0	do.	41	33.1	24.2	1.460	432 by 610	102	1.49	P	—	—	—
4-4-0	Balfour Lyon Soc. Mzta. y Galv	43.3	27.7	34.7	1.676	414 by 610	107	1.35	C	—	—	—
2-6-0	Baldwin-Lever Murphy-Vulcan	40.7	34.1	28.5	1.464	432 by 610	91	1.68	P	42	—	42
0-6-0	Rogers	34.8	34.8	No.	1.270	330 by 559	—	1.48	C	20	2	23
2-6-0	do.	32	29	33	1.422	419 by 610	95	—	A	4	—	4
4-4-0	do.	36.8	22	28.2	1.676	419 by 610	103	1.43	P	2	—	2
4-4-0	do.	34.4	22.4	26.5	1.676	381 by 610	—	—	P	—	—	—
2-6-0	do.	36.8	34.4	28.2	1.422	457 by 610	104	1.41	C	1	—	1
2-6-0	Baldwin-Maestranza Third Zone	37.2	31.4	31.8	1.422	457 by 610	—	—	C	8	—	8
0-6-2	Baldwin	42.6	31.4	29	1.422	432 by 610	98	1.60	C	1	—	1
4-4-0	Lever Murphy	41.7	26.5	23.8	1.118	381 by 610	59	1.04	A	—	—	—
4-4-0	Kuson	39.2	23.7	30.1	1.676	432 by 609	105	1.80	P	6	—	6
2-6-2	The Lima	56.2	35.7	30.1	1.422	457 by 600	95	1.66	C	1	—	1
0-4-2	Sharp Stewart	38.9	28	No.	1.270	406 by 610	96	1.80	A	2	—	2
4-4-0	Dubs	49.8	31.6	28	1.473	457 by 610	120	1.53	C	6	—	6
0-6-0	Baldwin	28.7	28.7	32	2.007	457 by 610	103	1.74	P	9	—	9
4-6-0	Rogers-Nacionales-Cook	51	37	24.9	1.143	381 by 610	59	1.04	A	—	—	—
0-6-0	Dubs	37	37	33	1.422	457 by 610	119	1.85	C	1	—	1
4-4-0	Rogers	51	31.3	No.	1.007	381 by 508	67	1.21	A	45	—	45
4-4-0	Baldwin	54	33	33	1.676	470 by 610	134	1.86	P	1	—	1
4-6-0	Baldwin	51.5	35.5	33	1.676	470 by 610	124	1.86	P	1	—	1
4-6-0	Rogers	56.2	38.9	33	1.422	470 by 610	118	1.95	C	2	—	2
4-6-0	Rogers	56.2	38.9	33	1.676	470 by 610	160	1.79	P	2	—	2

[illegible]

[NOTE.—In the service column the letters indicate as follows: A, yard; C, freight; P, passenger; and E, special.]

LOCOMOTIVES OF 1-METER GAGE

[NOTE.—In the service column the letters indicate as follows: A, yard; C, freight; P, passenger; P and C, passenger and freight]

Wheel arrange- ment	Manufacturer	Weight			Diameter of driving wheels	Cylinders	Heating surface	Grate area	Service	Number			
		Total	Locomo- tive	Tender						Active	Obsolete or knocked down	Rented or loaned	Total
0-6-0	St. Leonard	Tons 12	Tons 12	Tons No.	Meters 0.800	Millimeters 270 by 300	Square meters 28.38	Square meters 0.67	A	2	2		4
4-4-0	Schneider	19.5	13.6	15.6	1.140	330 by 406	51.30	.89	P	5			5
2-4-0	Nielson	15	12	No.	.900	245 by 450	34.60	.61	A		1		1
0-6-0	Koppel	16	16	No.	.762	310 by 349	46	.70	A		1		1
2-4-2	Rogers	22	12.2	13.9	1.200	356 by 457	63.18	.91	P and C				
2-8-0	Schneider	28	24.2	17.8	.910	370 by 450	73	1.05	P and C	1		1	3
0-6-4	Hunsler	35.7	27.5	No.	.864	381 by 457	63.63	1.17	A	9			9
2-6-0	Hannoversche	38	30	15.3	1.105	410 by 500	117.75	1.35	P and C	5			5
2-6-0	Borsig	28.2	24	16.1	1.100	360 by 550	76.50	1.35	P	9			9
2-6-0	Lima	34.3	30.4	16.2	1.219	381 by 559	81.49	1.19	P			1	1
2-6-2	Borsig	38	28	No.	1.100	360 by 550	76.50	1.35	P and C	2			2
2-6-0	Baldwin	32.5	27.7	18	1.066	381 by 457	90.17	.95	P and C				
2-2-0	Rogers	7.2	4.2	No.	.635	118 by 304	6.21	.27	P	1			1
4-6-0	Lever-Murphy	44	30	16	1.219	406 by 559	88.83	.92	P		3		3
4-6-0	do	38.5	28.5	16	1.016	406 by 457	82.52	.92	C		2		2
2-6-0	Koppel	42.3	36	22	1.105	410 by 500	116	1.60	P and C	3			3
2-8-0	Borsig	33	30	20	1.000	430 by 500	86	1.50	C	6			6
2-6-0	Henschel	40.7	33.5	25	1.105	410 by 500	117.50	1.95	P and C	10			10
2-8-0	Rogers	36	33.3	22.7	.991	406 by 457	87.19	1.20	P and C	10			10
	Hannoversche Arn Jung	42.9	38	14	1.015	445 by 500	116.45	1.85	P and C	{	1		1
2-6-0	Borsig	30.3	25	16.1	1.100	360 by 550	90	1.45	P	5			5
0-8-2	Esslingen	63.6	51.2	No.	.940	{ 1 480 by 500 2 430 by 450 }	165	2.40	P and C	6			6
2-8-2	Baldwin	75.7	55.8	No.	.940	{ 1 483 by 508 2 432 by 457 }	152.26	2.65	P and C	5			5
2-8-2	do	63.3	47.8	40	1.105	435 by 500	151.78	2.92	P and C	35			35
0-6-0	Vulcan	10.8	10.8	No.	.533	247 by 400	26.84	.58	A	2			2
0-6-0	do	15	15	No.	.762	279 by 406	38	.78	A	2			2
2-6-0	do	24.4	20.4	15.5	.965	330 by 457	66	1.15	C	2			2
	Total									126	11	2	139

1 Adhesion.

2 Rack.

LOCOMOTIVES OF 0.600-METER GAGE

[NOTE.—In the service column the letters indicate as follows: A, yard; P and C, passenger and freight]

Wheel arrange- ment	Manufacturer	Weight			Diameter of driving wheels	Cylinders	Heating surface	Grate area	Service	Number
		Total	Locomo- tive	Tender						
0-6-2	Arn Jung	Tons 22	Tons 18	Tons No.	Meters 0.700	Millimeters 300 by 350	Square meters 47	Square meters 0.72	P and C	3
0-6-0	do	15.5	15.5	No.	.630	235 by 300	24	.50	P and C	8
0-4-0	do	9.3	9.3	No.	.580	210 by 300	18	.40	P and C	4
0-6-2	Davenport	20	14.5	No.	.609	229 by 355	—	—	P and C	2
0-6-0	Koppel	9	9	No.	.470	178 by 229	—	—	A	1
0-4-0	Krupp	7	7	No.	.470	178 by 229	—	—	A	1
0-4-4	Henschel	6	6	No.	.300	178 by 229	—	—	A	1
0-6-2	Koppel	19.5	17.5	No.	.717	270 by 336	—	—	P and C	1
	Total	—	—	—	—	—	—	—	—	21

Appendix E.—RAIL MATERIAL SPECIFICATIONS

GENERAL PROVISIONS FOR RAIL AND TRACK EQUIPMENT PURCHASES

I.—GENERAL CONDITIONS

ARTICLE 1. Rails and track equipment must be manufactured in accordance with these conditions and in conformity with the plans referred to herein.

ART. 2. The State Railway Administration shall appoint special agents, properly authorized, for the factories manufacturing the material ordered.

These agents must exercise all necessary supervision to assure the faithful performance of the conditions of manufacture and must carry out all the inspections, tests, etc., indicated herein.

ART. 3. The factory may not begin the manufacturing work without a written order from the agent of the administration.

The agent must not issue this order until he has assured himself, from an examination of the samples and the performance of the proper tests, that the profile, the dimensions, and the weight of the material, as well as the composition and the resistance of the metal correspond to the conditions imposed.

ART. 4. The conditions, inspections, tests, etc., referred to in article 2 are outlined in the paragraphs corresponding to each class of material.

ART. 5. The agent of the administration shall make provisional acceptance at the factory of the material which conforms to the stipulated conditions.

General reports to be signed by the agent and the representative of the factory must be prepared with all documents of partial acceptance. These reports must be executed in duplicate, one copy to be retained by each of the signers.

The agent shall mark the rejected material with a conspicuous and indelible mark.

ART. 6. The contractor must provide all necessary facilities to make the tests, to verify the dimensions, and receive the material provisionally. All costs connected therewith shall be for his account exclusively.

ART. 7. After the provisional acceptance of the material, the latter shall be considered as the property of the administration.

ART. 8. The contractor must deliver to the point of destination all material received provisionally, in agreement with the agent of the administration.

The transportation of the material shall be for the account and risk of the contractor, and his liability does not cease entirely in any case of accident or force majeure that may occur.

ART. 9. The final acceptance of the material shall take place one year after the provisional acceptance. The contractor must replace at his expense all material which has deteriorated because of its inferior quality.

The amount of the guaranty deposit established in the call for bids shall be returned only after the material has been finally received and the contract fulfilled.

ART. 10. The supervision exercised at the factory by the agent, the verifications and tests, and the provisional acceptance of the material manufactured shall not in any case result in decreasing the responsibility of the contractor. The full responsibility of the contractor shall not cease until the expiration of the guaranty period.

ART. 11. The contractor may not have all or a part of the material ordered manufactured by other factories not approved by the administration without being authorized by a decree of the *dirección general*.

II.—RAILS

ART. 12. The cross section of the rails must conform accurately with the plans prepared for that purpose.

This condition must be verified by means of gages which the manufacturer must make in connection with these plans and which must be approved by the agent charged with the inspection and receiving of the material ordered.

To properly consider the difference of the section occurring from the wear and tear of the rolling cylinders or from their larger or smaller distance apart a tolerance of 0.0005 millimeter has been established for the various dimensions of the cross section.

ART. 13. The weight of the rails must be the weight corresponding to the type of rail ordered. Based on the density of the first rails manufactured, the Government agent shall establish a density at the factory, which must not in any case be less than 7.8.

A tolerance of 2 per cent shall be allowed for partial weighings of 10 rails and 1 per cent for total weighings.

ART. 14. At a temperature of 20° C., the length of the ordinary rails must be 9.15 meters (30 feet) and that of the short rails for the curves, 9.08 meters.

The smaller or greater tolerance allowed for the length of the bars is one six-thousandths of its length.

ART. 15. The manufacturer must mark the web of each rail with the name of the factory, the year of its manufacture, the initials F. C. del E., and the cast number. The characters must be in relief.

The ends of the cross sections of the short rails must also be painted.

ART. 16. The steel used in the manufacture of the rails must be homogeneous, compact, and sufficiently hard.

When fractured it must show a fine grain, uniform, without white or shiny spots. The steels must not have any flaws, cracks, or other defects.

ART. 17. As regards the chemical composition of the steel, the minimum proportion of carbon content of the metal is fixed at 0.35 per cent and the maximum tolerance permitted for the proportion of phosphorus, 0.10 per cent. The proportion of manganese must be approximately double that of the carbon.

ART. 18. The composition of the metal shall be verified by means of chemical tests with samples taken from each cast. The results of the tests must be shown by means of detailed tables.

If these tests indicate that the steel of a certain cast has a chemical composition not conforming with the aforesaid figures, the agent may instruct the manufacturer to make the changes in the manufacturing process which he believes will effect the desired composition. However, he shall accept the products of the casting operation provided they satisfy the other conditions and tests stipulated in these general specifications.

ART. 19. The manufacturing process used must be previously approved by the agent of the administration. In granting his approval the agent must consider particularly the nature of the castings and the reagents used.

ART. 20. The resistance of the steel shall be verified by means of traction tests with samples taken at the time of the casting.

The absolute resistance to fracture has been fixed at between 65 and 75 kilograms per square millimeter of first section, the elongations to vary between 18 and 12 per cent, respectively.

ART. 21. The samples used for these tests must consist of square sections, with sides of 0.012 meter and the elongations must be measured between two marks distant 0.100 meter from each other.

For each casting there shall be tested two samples, the first made of steel from the first ingot and the second with steel from the last ingot.

The metal of the casting shall be accepted if the tests of the two samples are satisfactory; if both tests are unsatisfactory, the metal shall be refused. If one of the bars tests satisfactorily and the other not, a third sample, corresponding to the defective piece, shall be removed from the same ingot and tested. If the test is satisfactory, the casting shall be accepted; otherwise it shall be refused.

ART. 22. The manufacturer of the rails must conform to the conditions stated in the following paragraphs.

(a) Upon their removal from the rollers the bars shall be cut at a sufficient distance from their ends to eliminate the manufacturing defects occurring in all cases. This operation shall be performed while the bars are hot. The two ends of each rail must be cut simultaneously with a circular saw.

If necessary, the rail points may be adjusted at once by passing them through an undercutting machine.

The length of the hot rail shall be so computed that it will be reduced to the normal size as soon as the rail cools off. If still too large, it shall be cut again while cool and undercut.

(b) The manufacturer must deliver the rails perfectly straight in all directions.

The rails must be struck with a wooden hammer to straighten them. The use of an iron hammer is strictly prohibited.

If the rails, when cold, are not perfectly straight, they must be straightened when cold with the use of a pressure apparatus or some analogous method.

(c) The holes for the circular bolts of the fishplates shall be made with a drill. A punch must never be used.

The number, diameter, and position of these holes must be as established in the official plans of the administration. The manufacturer must, as indicated, prepare the necessary gages, which must be approved by the agent and serve to show that the work conforms with the plans in every respect.

The tolerance for the position and the diameter of the holes is fixed at 0.0005 meter.

ART. 23. The agent must examine the quality of the rail during its manufacture by submitting it to the following tests:

(a) The object of the first series of experiments is to perform flection tests.

The rail shall be placed on two supports 1.10 meters apart and a certain load shall be placed at its middle point. This load shall remain on the rail for at least five minutes and is then removed and the rail must not have any permanent defect, if the load was less than that required to produce a strain of 35 kilograms per square millimeter at the fiber subject to most strain.

The pressure shall be promptly and gradually increased until the fracture of the bar. The permanent flaws that result must be carefully measured.

(b) The two pieces obtained from this test shall be subjected to shock tests, by placing them on supports 1.10 meters apart and striking them with a hammer of the weight especially fixed for that purpose and from the prescribed height. The mark resulting from each blow must be carefully measured.

These tests shall be repeated by increasing the height until the fracture of the bar is determined.

(c) To determine the uniformity of the texture of the steel of the rails, corrosion tests shall be performed, followed by observations with a microscope.

Detailed tables shall be prepared of all these experiments, showing the temperatures at which they were performed.

ART. 24. To supplement these tests, the agent of the administration shall order spring steel to be rolled with some rail points, which must, without deterioration, stand the elongation provided for in the special conditions.

Several rails laid flat shall be bent to a certain radius while cold. During this operation no cracks or fissures must be produced in the pieces.

Chisels shall also be made which must attack the surface of the gray cast pieces without wearing, notching, flattening, or breaking.

Last of all, the steel and rails manufactured must be submitted to all additional tests stipulated in the contract.

ART. 25. The tests shall be performed on two rails of each lot of 200 made. If the tests are satisfactory, the corresponding lot shall be accepted. If the two rails tested do not stand up in any of the tests required, the entire lot shall be rejected. If one stands up and the other not, a third shall be tested from the same casting which produced the unfavorable result. The lot shall be accepted if the tests with the new sample are satisfactory and rejected in other cases.

ART. 26. The said agent of the administration shall receive the material provisionally in the factory and during the manufacturing, separating the bars that satisfy the stipulated conditions and weighing and perforating them.

III.—FISHPLATES

ART. 27. The shape and dimensions of the fishplates must conform exactly with the plans prepared for that purpose.

This condition shall be verified by means of gages made by the manufacturers and approved by the administration's agent.

It shall also be verified whether the fishplates can be readily fitted to the model master rail and whether they are in contact therewith along the entire extension shown in the sketches.

The tolerance for the normal length has been fixed at 0.0025 meter, more or less.

ART. 28. The weight of the fishplates shall be established as provided for rails in article 13 hereof.

A tolerance of 2 per cent has been established for partial weighings and 1 per cent for total lot weighings.

ART. 29. On its outer side, each rail must bear the factory mark and the year of manufacture in raised characters.

ART. 30. Semihard steel must be used for the fishplates. When fractured the fishplates must show a fine grain, compact and uniform, without white or shiny spots. No cracks or flaws of any kind shall be permitted.

ART. 31. The chemical composition of the steel has been established as from 0.25 to 0.35 per cent carbon. The maximum phosphorus permitted shall be 0.10 per cent. The manganese must be approximately double the quantity of carbon.

ART. 32. The method used in its manufacture must be previously approved by the agent of the administration, who in granting his approval must consider the nature of the castings and the reagents used.

ART. 33. The resistance of the steel shall be determined by means of traction tests with samples taken at the time of the casting.

The absolute resistance to fracture is fixed at between 45 and 50 kilograms per square millimeter of first section. The elongation must be sufficient to result in a coefficient of quality at least equivalent to 1,250.

These tests must be performed in the manner and under the conditions established for rail metal. (Art. 21.)

ART. 34. As regards the details of manufacture of the fishplates, the conditions stipulated in the following paragraphs must be observed:

(a) When the bars are removed from the last roller they must be cut and straightened with a hand press or an analogous method, while hot. After the bars have cooled off, they must be cut and polished so that the section of the fishplate will not have any projection that may hinder contact with the rail along its entire length.

(b) The holes for the bolts must be made with a drill.

The number, diameter, and position of these holes shall be as provided for in the official plans of the administration. As instructed, the manufacturer must make a gage as approved by the agent to be used for verifying the correct performance of the work according to the plans.

The tolerance for the diameters of the holes is 0.00025 meter. No tolerance of any kind is fixed for the location of the holes. Verifications shall be performed by means of a special gage.

ART. 35. The agent must inspect the quality of the fishplates during the manufacturing work by submitting them to the following tests:

(a) Two rails 1.50 meters long shall be joined with the fishplates and the necessary bolts, leaving 0.0006 meter between the connected rails. The beam, thus formed, shall be placed with the shoe facing upward on two supports 1.10 meters apart. A certain pressure shall be applied at its central point. This pressure must be exerted for at least five minutes, and upon being removed there must be no permanent mark, if this pressure was smaller than that needed to produce a strain of 25 kilograms per square millimeter on the fiber under the greatest strain.

This load shall be gradually increased until the ends of the rails touch, unless they have previously fractured. Any permanent marks produced must be carefully measured.

(b) A piece formed analogously shall be placed on two supports 1.10 meters apart. At the junction, a hammer of a weight especially fixed shall be dropped from a certain height. After each blow, the permanent marks must be carefully measured.

The fishplates must stand without breaking the shock of these hammer blows from the maximum height prescribed in the special conditions.

These experiments shall be repeated until the ends of the rails touch, unless the fishplates or the bolts have previously fractured.

(c) To verify the uniformity of the steel of the fishplates, corrosion tests shall be performed, followed by observations with a microscope.

Detailed tables shall be prepared of all these experiments, showing the temperatures at which the first tests were performed.

ART. 36. Tests must be performed with 1 per cent of the fishplates manufactured. If two-thirds or more test satisfactorily, the corresponding shipment shall be accepted. If two-thirds or more do not stand up under the required tests, the entire shipment shall be refused. If the number of fishplates which did not stand up under the tests consist of between one-third and two-thirds of the total number tested, the tests shall be repeated with a number of fishplates equivalent to those refused and removed from the same casting, accepting the shipment if two-thirds of the pieces stand up under the tests and refusing it in the contrary case.

ART. 37. The agent shall receive the fishplates provisionally during their manufacture subject to the same formalities as those required for rails.

The fishplates shall be shipped to their destination packed in packages of five pairs fastened with wire.

IV.—BOLTS

ART. 38. The shape and dimensions of the bolts must conform exactly with the plans prepared for that purpose and with the gages used to verify the sizes.

The threads of the nuts and bolts must be of the prescribed length and regular. The nut must have no play in the threads of the bolt. It must not be possible to

press it with the hand. Its inner face must be strictly perpendicular to the stem of the bolt, so that its entire section may serve to resist the forces to which it may be subjected.

The aforesaid conditions shall be considered verified if any nut may be fastened to a bolt selected at random, and vice versa.

The nuts must be "patent"; that is, so made that when forced they will open like a spring, even if they do not conform to the type indicated in the plans.

No tolerance is provided for the diameter and the threaded lengths. The tolerance for the straight parts is fixed at 0.0005 meter over the diameters or the thicknesses and 0.001 meter over the lengths.

ART. 39. The normal weight of the bolts shall be verified when the manufacturing begins by comparing the figures shown on the sketches with those of the pieces completed.

After the agent of the administration has accepted the bolts submitted, he shall determine their weight, which shall serve for the total of the contract. There shall be a tolerance of 4 per cent for partial weighings and 2 per cent for total weighings.

ART. 40. The bolts and nuts must be of semihard steel and must be manufactured by processes not altering their resistance.

The agent must assure himself that the steel used for making the bolts and nuts has all desirable safety conditions. It must not be brittle while either hot or cold. It must not stretch readily when struck with a hammer. It must be possible to perforate it either hot or cold without breaks or chippings. When cut it must appear homogeneous, without flaws, when broken, it must be of a light color. There must be no trace of any soldering, breaks, or depuration defects.

ART. 41. The edges must be keen and regular, the surfaces perfectly united, straight, and without seams. The heads must be well centered and perpendicular to the stem.

The extremities of the bolts must be slightly chamfered and the threaded parts must show no breaks of any kind.

The collars must be very smooth and annealed after cut to increase their ductility.

ART. 42. The quality of the metals used for their manufacture shall be tested as follows:

Bolt and nut steel.

Under traction, the steel must stand up without elongation of a permanent nature under a minimum force of 22 kilograms per square millimeter of section. When the tests are continued until the fracture of the steel, the resistance must be between 45 and 50 kilograms per square millimeter of first section, with a minimum elongation of 18 per cent for samples analogous to those indicated in article 21.

The steel must also resist, without scratches or cracks, being bent through an angle of 90°. This operation must be performed while the steel is cold. The bar must be promptly straightened out and show no defect of any kind.

ART. 43. The tests for the manufactured bolts are as follows:

(a) *Bolts*.—Bolts with nuts must be subjected to the traction test until they fracture, with the coefficients already mentioned.

The threaded part must be bent cold through an angle of 45°, then promptly straightened. There must be no cracks or scratches visible.

The head shall be bent through an angle of 12°, without showing any cracks in the collar of the bolt.

(b) *Nuts*.—The nuts must be tested separately, crushing them with a hammer until they are reduced to one-third of their height. No cracks must appear in their perimeter after this operation.

ART. 44. The agent of the administration shall also subject the metal used and the bolts and nuts already made to all the additional tests provided for in the special contract conditions.

ART. 45. Tests shall be performed with 5 per cent of the bolts made. If more than one-half of the bolts tested produce satisfactory results, the entire lot shall be accepted. If one-half or more do not fulfill any of the test requirements specified, the shipment will be refused.

ART. 46. After the bolts are manufactured, they shall be stored in a very dry place and may not be removed from the factory without having been previously oiled.

The bolts must be packed in wooden barrels or boxes always containing the same number of units of the same kind.

The barrels or boxes must be marked with the number and weight of the bolts packed therein. The characters must be indelible.

The agent shall seal the barrels. His seal shall serve as a mark of provisional acceptance at the factory.

V.—SPIKES

ART. 47. The shape and dimensions of spikes must conform exactly with the plans prepared for that purpose.

The tolerance for the transversal dimensions is 0.001 meter and for the length, 0.005 meter.

ART. 48. The normal weight of the spikes must be verified at the start of the manufacturing operations by comparing the weight figures on the sketches with those of the completed spikes. When the agent of the administration has declared the spikes acceptable he shall determine their weight, which shall serve for the entire contract. A tolerance of 4 per cent is established for partial weighings and 2 per cent for total weighings.

ART. 49. The spikes must be made of soft steel of a resistance of from 38 to 42 kilograms per square millimeter of section and a minimum elongation of 22 per cent.

ART. 50. Moreover, the tested samples must stand being bent, without cracking or wearing, until their two extremities touch. This operation must be performed while the spike is cold. The bar must then be straightened at once and present no defects.

ART. 51. These same tests shall be applied to spikes already manufactured. The head must also be bent through an angle of 12° without showing any cracks.

ART. 52. The agent must also subject the steel used and the spikes manufactured therefrom to all the additional tests stipulated in the contract.

ART. 53. Five per cent of the spikes made must be tested. If more than half of the test pieces produce satisfactory results, the entire lot shall be accepted; if half or more of them do not stand any of the prescribed tests satisfactorily, the entire shipment shall be refused.

ART. 54. After their manufacture, the spikes shall be stored in a very dry place and must be tarred before leaving the factory.

The spikes must be packed in wooden barrels or cases always containing the same number of units.

The agent of the administration shall seal these barrels and his seal shall serve as a mark of provisional acceptance at the factory.

VI.—TIE-PLATES

ART. 55. The shape and dimensions of the tie-plates must conform exactly with the plans prepared for that purpose.

This condition shall be verified by means of gages constructed by the manufacturer and approved by the agent.

A tolerance of 0.002 meter, more or less, has been fixed over the normal length.

ART. 56. The weight of the tie-plate must be that corresponding to the type contracted for. This weight shall be established at the factory by the agent, based on the density of the first tie-plates manufactured. This density must never be less than 7.7.

A tolerance of 2 per cent has been established for partial weighings of 40 tie-plates and 1 per cent for total weighings.

ART. 57. Each tie-plate must be plainly marked in raised characters with the factory mark, the year of manufacture, and the letter indicating the type in conformity with the respective plan.

ART. 58. The steel used for the tie-plates must be semihard, presenting a fine grain when fractured, compact and uniform, without white or shiny spots. The steel must have no flaws, cracks, or blast marks of any kind.

ART. 59. As regards the chemical composition of the steel, the maximum proportion of carbon is established as 0.25 per cent and the maximum tolerance in case of phosphorus 10 per cent, and the proportion of manganese from 0.40 to 0.60 per cent.

ART. 60. The resistance of the steel shall be determined by means of traction tests with samples taken at the time of the casting.

The absolute resistance to fracture is established as between 45 and 55 kilograms per square millimeter of first section. The minimum elongation permitted is 0.25 per cent.

These tests must be performed in the manner and under the conditions stated for rail metal (art. 21).

ART. 61. The manufacture of the tie-plates must conform to the conditions specified in the following paragraphs:

(a) The bars, when withdrawn from the last roller, must be straightened while hot with wooden hammers or some other analogous process. After the bars are cold, they shall be cut into pieces of the prescribed length.

(b) The holes for the bolts must be made with a drill or a punch, the latter to be used either while the metal is hot or cold.

The number, dimensions, and position of these holes shall be fixed, in each special case, in the plans prepared for that purpose. As provided for in the plans, the manufacturer must make a gage as approved by the agent to verify the fact that the entire work is being performed according to plans.

The additional dimension set as a tolerance for the sizes of the said holes is 0.001 meter, and the same as regards the location of the holes.

(c) After completing this operation, the tie-plates shall be straightened, while either hot or cold, by means of a hand press. If the holes were drilled while the metal was cold, they shall be annealed.

ART. 62. The agent of the administration must inspect the quality of the tie-plates during their manufacture, subjecting them to the following tests:

(a) Test pieces shall be cut from the rolled bars, according to the profile of the tie-plates for direct traction tests, which shall be subjected to the same load limits and elongation as are established for cast metal.

(b) For shock tests, the tie-plate entirely completed shall be placed so that its projecting parts will rest on supports conveniently spaced. They are then struck in the central part of this space between the supports with a hammer of a weight especially fixed and falling from certain heights. After each blow, the resulting permanent marks shall be measured.

The tie-plates must stand without fracturing the shock of this hammer when it falls from the maximum height fixed in the list of special conditions of the contract.

These experiments shall be continued until the tie-plates fracture.

(c) The third series of experiments shall consist of bending tests, whereby the tie-plate is subjected to a flexion force by means of a lever.

The tie-plate is thus bent through an angle of 30° and must not break after two successive bending and straightening operations.

(d) The bars must be perforated by means of the punch near the edges in order that the possibilities of breakage or cracking of the metal may thus be determined.

The object of this test is to enable the agent to determine whether the punch may be used to make the holes in the tie-plates. This is a condition which the bars must satisfy.

Detailed tables must be prepared for these experiments showing the temperatures at which they were conducted.

ART. 63. The agent of the administration shall also subject the tie-plates manufactured to all additional tests stipulated in the special contract conditions.

ART. 64. The number of tests and the conditions for accepting or rejecting each shipment of tie-plates are the same as established for the fish-plates in article 36 hereof.

ART. 65. The agent shall receive the tie-plates provisionally during their manufacture. This provisional acceptance shall be subject to all the formalities required for rails. (Art. 26.)

The tie-plates shall be shipped to the point of destination in packages containing 10 units, tied with wires after having been thoroughly cleaned from oxide and subjected to a hot linseed oil bath.

VII.—SWITCHES AND CROSSINGS

ART. 66. As regards the quality of the materials, the form and dimensions of their component parts, purchases of switches and crossings, complete, made from rails, shall be subject to the specifications governing parts of the same nature as provided herein and to the provisions of the following articles.

This material must also comply with the stipulations if the switches and crossings are made of cast steel or manganese steel such as the administration purchases from reliable firms in exceptional cases. In this case the respective contract must specify the conditions to be fulfilled by the material used and the changes that may be needed or may be proper to introduce in the plans because of the nature of this material.

ART. 67. The shape and dimensions of the various parts must conform with the plans prepared for that purpose, with the tolerances fixed herein.

Furthermore, the dismantled parts must be suited for any apparatus of the same kind.

ART. 68. The weight of the various units or parts making up the switches or crossings must be the weight that corresponds to the type contracted for. The weight shall be at the factory by the agent based on the weight of the first equipment manufactured.

A tolerance of 2 per cent is permitted for partial weighings of 10 of these apparatuses and 1 per cent for total weighings.

ART. 69. Each apparatus must be plainly marked in raised characters with the factory mark, the year of manufacture, and the type letter. These marks must appear on each of the switch rails and crossing rails.

ART. 70. In order that the rails may have the shape indicated in the plans, they shall be manufactured as follows:

(a) The work must be performed while the metal is cold, with the exception of the curves, which must be made by previously heating the rails with the precautions necessary so as not to change the quality of the metal. For each curving operation, the pieces must undergo only one heating, the temperature of which does not reach above the cherry-red point or does not go below the dark red during the operation.

(b) The cuts from the various bars must be obtained with a view of having perfectly smooth surfaces. A plane is required to finish the flat cuts performed in the direction of the length of the piece.

(c) The holes for the bolts or rivets must be drilled.

(d) The sketch of distribution of these holes must be approximated by less than 1 millimeter.

ART. 71. The rivets and the jointed bars which connect the two switch blades must be of steel of the same grade as required herein for bolt steel.

ART. 72. The switch stand, keys, and blocks, except those indicated in the following article shall be made from gray cast ingots of cast iron. These parts must be fine grained, homogeneous, and without flaws.

The following tests shall be performed to prove the good quality of the cast:

(a) A raw bar of this metal, with a square section of 30 millimeters per side, placed on two supports on a level 1 meter apart, must stand at its central portion a load which increases progressively up to 450 kilograms without breaking.

(b) With a chisel placed in the usual way on one of the longitudinal edges of a bar with a rectangular section, it must be possible to make a fine dent without breaking the edge.

ART. 73. The blocks intended to connect the keys to the switch must be of steel.

SPECIFICATIONS FOR AUTOMATIC COUPLINGS

1. *Purchasing system.*—These specifications refer to all automatic couplings purchased by the company. Purchases shall be made in lots of 200, and for each lot the manufacturer must deliver, free of charge, four extra couplings for the necessary tests. He must also furnish two pins for the spring, extra, for the same purpose.

2. *Class of material.*—The couplings delivered according to these specifications must be of cast steel, prepared by a process approved by this company and must not be painted. The pins for the springs must conform to the special specifications now in force.

3. *Obligations of manufacturers.*—All couplings must be tested and inspected as ordered by the company, as to their mechanical operation, general conditions, and resistance. The inspection and test shall be performed at the place designated by the company, and the manufacturer must furnish all necessary facilities without charge to the company. Test pieces shall be taken from each cast and the lot shall be accepted or refused according to specifications No. 3 in force.

All coupling pieces must conform strictly to the sketches and the patterns and calibers furnished by the manufacturer must be used. These patterns must apply to all coupling surfaces to assure the absolute interchange and free movement of the various parts, without the need of important corrections.

As soon as mounted the spring, locking pins, and blocks must operate freely. But between the spring and the head there must not be more than 3.2 millimeters of play vertically, or between the spring and the blocks there should not be sufficient play to allow the spring to move in front of the general contour line.

It is advisable to have from 6.3 to 9.5 millimeters of play in the opposite direction.

These couplings must couple and uncouple each other, with one or two springs open, and also the model coupling which the manufacturer must always keep as a type. They must close easily when the spring is pushed by the hand and must be constructed in such a manner that they will not disconnect, if the pin of the spring comes out or breaks.

Unless otherwise specified, they must have steel pins 41.3 millimeters in diameter and a sufficient length to enable the application of a 9.5-millimeter key at the lower part.

The center of the locking pin must be on the longitudinal vertical plane of the coupling and must be operated from above.

The heads and springs shall not be received if they are deformed by improper adjusting between the casting boxes, and have any casting defect. There must be no cracks due to contractions, blastings, sand, etc. The holes for the pins must be drilled, or, if bores are used, they must be verified and must not be more than 8 millimeters greater than the pin.

The holes must be parallel to the side of the head and spring and at right angles with the central horizontal plane. The holes for the rivets must be drilled; if not, they must be rectified with a drill or drill bit to the sizes shown in the sketch. The holes must be at right angles with the axis of the head.

All the pieces must be annealed.

The faces of the side of the coupling and spring must be clean, soft, and at right angles with the axis of the head.

Each coupling must be stamped with the number of the cast in raised letters, the factory mark on a part not subject to wear and tear, and the inspector's number.

4. *Inspection.*—The couplings, after the inspector has satisfied himself that the foregoing provisions have been complied with, shall be divided into groups of 102, if possible, all of one cast in one lot, for the tests described below. If the contractor desires to make deliveries in smaller lots than those indicated, he must always deliver at his own cost the number of couplings needed to perform the tests described.

The inspector shall examine and apply the patterns to each coupling, verifying the dimensions, surface defects, etc. Any irregularities in shape must be corrected and the coupling must conform strictly to the plan before a lot is received. After this inspection, the inspector shall select a complete coupling from each lot for test No. 1. If the coupling does not test out satisfactorily but has stood the number of blows permitting a new test, a second coupling shall be taken from the same lot. If the second test is satisfactory, the lot shall be received in so far as the first test is concerned.

In this case, the manufacturer must replace the extra coupling at his cost.

From the 202 remaining couplings, one complete coupling shall be removed for test No. 2 and one for test No. 3.

If any of the couplings fail to test satisfactorily, but before breaking has stood the number of blows entitling it to another test, another coupling shall be removed from the same lot. If the second coupling tests satisfactorily, the 200 couplings shall be received in so far as the first test is concerned; otherwise, the entire shipment shall be refused. This extra coupling must also be delivered to the company free of charge.

After three satisfactory tests are performed, the inspector shall select two pins and the two extra pins, which shall be subject to the special specifications governing them.

If the pins test satisfactorily, the couplings shall be received finally; otherwise the manufacturer must replace all the pins in the shipment and submit them for another test.

The final defect of any piece shall not be held as applicable to the entire coupling, but only to the part in question. The latter may be changed for the entire lot, all previous tests to be considered void.

5. *Shock tests with the closed spring of the complete coupling—Test No. 1.*—Preparation: One point, three centers, according to the axis, shall be marked on the base of the coupling.

The coupling shall then be fixed in the machine vertical to its axis, coinciding with the axis of the weight in such a way as to impede the lateral movement, with clamps, straightening board, etc. The latter must be refastened after each blow.

The number of blows to be struck on the spring shall be: Three of 745 kilograms, falling from a height of 1.50 meters and three of 745 kilograms from a height of 3 meters.

The coupling shall be refused if it breaks before it has stood three blows of 745 kilograms from 1.50 meters and three blows from a height of 3 meters, or if cracks are noted more than 25 millimeters long or openings more than 1.6 millimeters,

or if the center line has deviated more than 48 millimeters after receiving three blows from a height of 3 meters, or if the spring has closed more than 18.9 millimeters from its original position, or if it can not be opened, the closing mechanism remaining in a bad condition after receiving the blows from a height of three meters.

If before cracking the coupling stood three blows from a height of 1.50 meters and one from a height of 3 meters, another coupling shall be selected and the test repeated.

6. *Head test—Test No. 2.*—The coupling is dismantled, leaving only the head, and marks are made as described before with a center line parallel to the axis, and the implement is then placed in position below a hammer and the clamps tightened before each blow. The base must rest directly on the anvil and the axis of the coupling must coincide with that of the machine.

The number of blows shall be as follows: Three 745-kilogram blows from a height of 0.91 meter and four 745-kilogram blows from a height of 1.50 meters.

The coupling shall be refused if it breaks before receiving three blows from a height of 0.91 meter and four blows from a height of 1.50 meters, or if there appear cracks of more than 25 millimeters in length or if there are openings of more than 1.6 millimeters for a head or bar 127 by 127 millimeters, or if the distance between the points marked at the base has separated for more than 11.2 millimeters. The axial deflection must not exceed 38.1 millimeters for couplings having a section up to 177.8 by 127 millimeters at the head, or 47.6 millimeters for couplings up to 127 by 127 millimeters at the head. The deformation of the mouth must not exceed 11.1 millimeters.

If the head or bar before cracking stood three blows from a height of 0.91 meter and two blows from a height of 1.50 meters, another coupling shall be selected and the test repeated.

7. *Complete coupling—Test No. 3.*—A coupling shall be placed in an inverted position on the anvil of the test machine and a compensating bar resting at a level, one extremity on the closed spring and the other on the compensating spring of the anvil. The weight must strike the compensating bar in the center of the points of support.

The following number of blows must be struck: Three 745-kilogram blows from a height of 1.50 meters and three 745-kilogram blows from a height of 3 meters.

The coupling shall be refused if it breaks before receiving three blows from a height of 1.50 meters and three blows from 3 meters, or if there appear cracks more than 25 millimeters long or more than 1.6 millimeters wide, or if the spring opens for more than 18.9 millimeters from its original position after the third blow from a height of 3 meters, or if the compensating bar does not remain in place after the blow, or if the spring does not open or if the closing mechanism does not operate after the test.

If the coupling has withstood three blows from a height of 1.50 meters and one from 3 meters before breaking, the test shall be repeated with a second coupling from the same lot.

8. *Test No. 4.*—The couplings must comply with the general specifications for cast-steel tests, extra soft quality.

9. *Shipments.*—All couplings must be marked by the inspector with his own mark. The inspector must make a complete list of his number, number of the lot, and number of the cast.

10. *Charges.*—All freight, drayage, and other charges covering rejected shipments shall be for the account of the contractor.

SPECIFICATIONS FOR PINS FOR SPRING COUPLING DEVICES

I. GENERAL REMARKS

1. *Orders.*—Orders shall be placed in accordance with the needs of the service, either separately or complete with the coupling.

2. *Shipment.*—The pins must be packed and shipped in presence of the inspector of the company.

II. MANUFACTURE

By the open-hearth system or any other process approved by the company.

3. *Annealing.*—The pins shall be annealed for performing the physical tests.

If the results of the physical tests of a lot of pins do not conform with the specifications, the manufacturer may repeat the annealing operating, but only two more times.

III. CHEMICAL PROPERTIES AND TESTS

4. *Composition*.—The steel must be of the following chemical composition:

Carbon.....	per cent..	0. 55 to 0. 70
Manganese.....	do.....	0. 40 to 0. 60
Phosphorus, no more than.....	do.....	0. 05
Sulphur, no more than.....	do.....	0. 05

5. *Specimens for chemical analysis*.—Shavings shall be taken from one of the specimens used for the hammer tests.

IV. PHYSICAL PROPERTIES AND TESTS

6. *Hammer test*.—The pins resting on round supports rigidly held at 254 millimeters from center to center shall be given a blow of 745 kilograms from a height of 0.91 meter or of 1,000 kilograms from a height of 0.63 meter and must have a deflection not less than 15° or more than 30° without breaking or splitting.

7. *Sample*.—A completed pin shall be selected by the inspector as a sample.

8. *Number of tests*.—One test shall be made for each 100 pins or fraction. The samples must be furnished free of charge by the manufacturer and must be in addition to the number ordered in the contract.

V. VARIATIONS PERMITTED

9. *Variations*.—The diameter of the pins must conform to the plans of the company. The length must not vary more than 3.2 millimeters from that specified.

10. *Finish*.—The finished pin must be regular in form, with a uniform diameter and not painted.

11. *Marks*.—Each pin must bear the lot mark and the stamp of the inspector as soon as the lot is accepted.

VI. INSPECTION AND REJECTION

12. *Inspection*.—The inspector shall select one pin for the hammer test and must also observe that all sketches and other specifications were complied with.

The manufacturer is obligated to transport at his cost the specimens selected for tests.

The inspector must be given free access to all sections of the factory during the life of the contract.

13. *Rejection*.—All pins represented by the specimens which did not comply with the specifications shall be rejected.

14. *Claims*.—The specimens of the material rejected shall be kept for one month, after which time no claim of any kind shall be considered.

15. *Charges*.—Freight and drayage charges, etc., for handling the rejected material shall be for the account of the manufacturer.

SPECIFICATIONS FOR BELTING FOR LIGHT GENERATORS IN RAILWAY COACHES

1. *General remarks*.—These specifications refer to the purchase of rubber belting used for light generators in passenger coaches.

2. *Manufacture*.—(a) *Material*: The texture and composition of the rubber used to make the belts must be of the best grade for that purpose.

(b) *Construction*: All the belts shall be 76.2 millimeters (3 inches) wide, 5-ply. The belt must have a rubber covering 0.8 millimeters ($\frac{1}{2}$ inch) thick, which adheres to the texture in such a manner that it can not be removed without breaking. It must also be strong enough to resist the wear and tear caused by the friction of the pulleys. It must be reinforced with steel wires.

Each strip 3.60 meters long, or any other length ordered, must have its edges entirely parallel when placed on the ground. No sewed, woven, or balata belts shall be accepted.

(c) *Marks*: For every 50 meters of length all belts must have attached to them disks or small sheets of rubber, vulcanized, with the factory mark, date of manufacture, and series number.

3. *Physical properties and tests*.—(a) *Friction tests*: A piece 152 millimeters (6 inches) long by 25.4 millimeters (1 inch) wide shall be cut from the sample. From this piece, there shall be removed two samples of two plies each, to be tested separately as follows:

The two plies of a sample shall be separated at one end for a distance necessary to place one ply in the upper hook of the machine and the other in the lower hook. The tension in kilograms necessary to separate the two plies shall be

noted in three different places and the average of the three observations for each of the two sample pieces shall be considered as the friction. The friction must not be less than 8.3 kilograms. The velocity of the machinery during the test must be 50.8 centimeters (20 inches) per minute.

(b) *Elongation test*: A sample piece 76 centimeters (30 inches) long is marked with two points at a distance of 45.7 centimeters (18 inches) apart, both points at the same distance from the ends. The sample is stretched at a tension of 1,400 kilograms for a belt of 76.2 millimeters. Upon reaching the said tension the elongation must not be greater than 50.8 millimeters for the distance of 45.7 centimeters.

After determining the elongation, the belt shall be broken. The breaking load must not be less than 1,800 kilograms at a machinery velocity of 101.6 millimeters (4 inches) per minute.

4. *Certificate of quality*.—All bidders must obtain a satisfactory certificate of quality from the Sección Pruebas of the Departamento de Materiales. This document is absolutely necessary and must be submitted with the bids. The sample pieces must be furnished one month before the date set for the opening of the bids.

5. *Samples*.—The samples for the friction test must be taken from the longitudinal axis of the belt. The sample for the tension test must be of the width and thickness of the belt.

6. *Number of tests*.—One friction test and one elongation test shall be performed for each 150 meters or fraction.

7. *Place of test*.—Unless otherwise specified, all tests shall be performed at the Sección Pruebas of the Departamento de Materiales.

8. *Workmanship*.—The rubber substance must be firmly attached to the texture and the finished belt must not vary more than 4.8 millimeters ($\frac{3}{16}$ inch) in width at both sides from the dimension specified and must be free from all defects.

9. *Marks*.—The name of the manufacturer, the order number, the weight, and number of meters must be plainly stamped on the covering of each roll.

10. *Inspection*.—The inspector must note that the belt complies with the specifications as to the workmanship and dimensions. He must select the samples required and send them promptly to the Sección Pruebas for the test.

11. *Rejections*.—All belts from which sample pieces are removed which do not satisfy the requirements indicated herein, shall be rejected.

A belt which is not furnished as specified, or which, after the inspection and acceptance indicated herein, shows serious defects, or does not operate properly in the pulleys, shall be rejected and must be replaced at the cost of the bidder.

SPECIFICATIONS FOR BOLTS AND NUTS

1. *General remarks*.—These specifications refer to the purchase of bolts and nuts for the use of the railway to be purchased by kilograms of net weight.

2. *Manufacture*.—The bolts and nuts must be made of soft iron, extra quality, according to specification No. 58 of the company.

3. *Threading*.—The threads of the bolts and nuts must be made while cold, according to the Whitworth system. The threads must be carefully cut, of full dimensions, smooth, and without seams.

The nuts must be interchangeable.

4. *Length of the thread*.—The thread must have a useful length, at least equal to that indicated in the plan.

5. *Milling of the points*.—The extremity of the thread must be milled so as to eliminate all traces of the cutting.

6. *Tolerances in the dimensions*.—The dimensions shall be verified carefully. The bolts and nuts with head and stem that do not conform to the plan as regards dimensions shall be refused if they exceed the following tolerances:

(a) One millimeter more or less in the useful length of the thread.

(b) Two millimeters more or less in the total length of the stem of the bolt, beginning with the base of the head.

(c) One-half millimeter more (but not less) in the diameter of the threaded part.

(d) One-half millimeter more (but not less) in the diameter of the part not threaded.

(e) One-half millimeter more or less in the height of the nuts.

7. *Marks*.—The head of the bolts must bear, in relief, the mark of the manufacturer.

8. *Nuts*.—The nuts must conform strictly to the plans and must have no defects.

9. *Number of tests*.—A sufficient number of tests must be made as stated below, in order that the inspector may obtain a clear idea as to the condition of the material.

10. *Bolt test*.—The bolt shall be tested while cold, bending them at right angles at the threaded part so that they may be struck with a hammer without showing any indications of a breakage.

The lot represented by the samples shall be refused if more than 10 per cent of the bolts submitted to this test give an unsatisfactory result.

11. *Nut test*.—Nuts shall be submitted while cold to the following test:

(a) *Widening test*: For this purpose the conical mandrel shall be inserted into the central opening. The hole must be able to increase its diameter by one-tenth without producing any breakage or wear.

(b) *Flattening test*: The nut will be compressed perpendicular to its axis until the sides of the central opening touch without producing any signs of breaking. If more than 10 per cent of the nuts submitted to these tests give unsatisfactory results, the lot shall be refused.

12. *Tension test*.—No less than six tension tests shall be performed for each lot (50 cases). All these tests must comply with the requirements of specification No. 57.

13. *Laboratory*.—The test shall be performed in the laboratory of the factory or in the laboratory designated by the company, or, if requested, in the laboratory of the company at Santiago.

14. *Packing*.—The bolts must be packed in cases or kegs with a maximum weight of 40 kilograms. These containers must bear the mark of the company, the net and gross weight, and the dimensions of the bolts packed therein.

15. *Rejections*.—All bolts and nuts not conforming to these specifications shall be rejected.

16. *Claims*.—The sample shall be kept for seven days after notice has been sent that the lot is rejected. After this time the contractor shall lose all right to claim them.

17. *Charges*.—All transportation and drayage charges, etc., for the rejected material shall be for the account of the contractor.

SPECIFICATIONS FOR RAIL BOLTS

1. *General remarks*.—These specifications refer to the purchase of rail bolts for the State Railways according to the standards of the American Railway Engineering Association.

2. *Material*.—The steel shall be made by the open-hearth process (Siemens-Martin) or by some other approved method.

The bolts may be tempered if necessary to assure the desired properties.

3. *Physical properties and tests*.—The bolts shall conform to the following requirements.

For steel: Limit of elasticity not less than 24,605 kilograms per square centimeter (35,000 pounds per square inch). Elongation not less than 25 per cent in 5 centimeters. Contraction not less than 50 per cent.

For nickel and other steel alloys, not treated: Limit of elasticity not less than 31,635 kilograms per square centimeter (45,000 pounds per square inch). Elongation not less than 20 per cent in 5 centimeters. Contraction not less than 40 per cent.

For nickel and other tempered steel alloys: Limit of elasticity not less than 52,375 kilograms per square centimeter (75,000 pounds per square inch). Elongation not less than 15 per cent in 5 centimeters. Contraction not less than 40 per cent.

The limit of elasticity must never be less than 50 per cent of the breaking (maximum) load.

The limit of elasticity, elongation, and contraction may be determined for a finished bolt or a test piece measuring 12.7 by 50.8 millimeters ($\frac{1}{2}$ by 2 inches), obtained from a finished bolt.

The ductility of the bolts shall be determined by the cold bending test, by which the material used must stand being bent cold through 180° without cracking on the outside of the bent portion. This bend test may be performed at the threadless portion of the bolt, or with a smooth bolt or test specimen of the same

dimensions and class of steel, in all cases subject to the same tempering as the finished bolt.

It is not necessary for the bolt to be bent twice at the threaded part.

A sufficient number of tests shall be performed to satisfy the inspector that the material complies with all of the specifications.

4. *Workmanship and finish.*—Subject to the following tolerances, the bolts must conform to the plans submitted to the manufacturer: The variation in the length shall not be less than 1.587 millimeters ($\frac{1}{16}$ inch) or 3.175 millimeters ($\frac{1}{8}$ inch) over the stipulated dimensions. The dimensions of the head must not vary more than $\frac{1}{8}$ inch from the stipulated dimensions. The external dimensions of the nuts must not vary more than $\frac{1}{32}$ inch (0.8 millimeters) from the stipulated dimensions. The stem of the bolt must not vary more than $\frac{1}{64}$ inch (0.4 millimeters). The shoulders of the bolt must not vary more than 0.4 millimeters ($\frac{1}{64}$ inch). The heads and bolts must be free from cracks and defects of any nature.

The bolts and nuts shall have United States Standard threads unless others are specified. The threads must be rolled or cut and shall be sound and sharp with no more than five nor less than two "finger threads." Care should be observed to avoid all damages to the metal by superheating in manufacture.

5. *Inspection.*—If necessary, the manufacturer shall furnish specimens of bolts of a previous rolling before filling the order. He must give ample advance notice of the date on which the specimens will be ready for inspection.

The inspectors representing the buyer shall have free entry at all times while work on the contract of the purchaser is being performed to all parts of the plant where work is being performed on the bolts ordered. The inspection shall be performed at the place of manufacture and the manufacturer shall furnish, without charge, all reasonable facilities to satisfy the inspector that the bolts are being made in accordance with the specifications.

The finished product shall be tested from specimens selected by the inspector from each lot of 100 packages. Two test pieces shall be selected for each test and if both satisfy the requirements of the specifications that particular lot shall be received. If one test piece proves unsatisfactory, a third shall be selected and tested. If the third specimen satisfies the requirements of the specifications, the lot shall be received, otherwise it shall be refused. If it is subsequently shown that some bolts are defective because of the material or its manufacture, the bolts shall be refused.

6. *Marking and shipment.*—The bolts, when shipped, must have the nuts put on, at least on two threads, they must be properly oiled and packed correctly, all packages must be marked to show the material and size of the bolts and the name of the manufacturer.

SPECIFICATIONS FOR STEEL FISHPLATES

1. *General remarks.*—These specifications refer to the purchase of steel fishplates for the State Railways according to the standards of the American Railway Engineering Association.

2. *Bases of the purchase.*—(a) The inspectors representing the buyer shall, during the life of the contract, have access to all parts of the factory connected with the manufacture of the fishplates ordered; the manufacturer shall give the inspectors, gratuitously, all material they may require to assure themselves that the fishplates are being made in accordance with these specifications.

(b) All tests and inspections must be made at the place of manufacture before the fishplates are shipped and in such a manner as not to interrupt unnecessarily the operation of the factory.

3. *Material.*—The fishplates must be made of open-hearth steel.

4. *Chemical properties.*—The chemical composition of each steel casting of the fishplates must be within the following limit: Phosphorus, not more than 1.04.

To verify the chemical composition, the manufacturer must furnish the inspectors a report of the analysis of the test ingot made during the pouring of the casting, showing the carbon, manganese, phosphorus, and sulphur contained in each casting. The buyer may make a check verifying analysis in conformity with the stipulations of article 1.

5. *Physical properties and test.*—The fishplates must conform to the following physical requirements:

(a) Resistance to traction: Minimum 59,765 kilograms per square millimeter (85,000 pounds per square inch).

(b) Expansion: Minimum, 16 per cent in 5 centimeters (2 inches).

(c) Bending while cold, without fractures on the outside of the bent part, through 90° around an arc with a diameter three times the thickness of the test piece.

All the test pieces must be cut from finished fishplates.

(a) For the traction tests there shall be used the test pieces adopted by the American Society for Testing Materials, the dimensions of which are 12.7 by 50.8 millimeters ($\frac{1}{4}$ by 2 inches).

(b) The piece used for the bending test must have a section of 3.22 square centimeters ($\frac{1}{2}$ square inch) or a rectangular bar of 12.7 millimeters thick ($\frac{1}{2}$ inch) with the two parallel faces which were rolled.

6. *General requirements.*—(a) The various sections of the fishplate shall be rolled according to the specified dimensions and the designs furnished by the buyer. Variations in the dimensions affecting the proper fitting of the fishplate to the rail will not be permitted. The maximum curve in any of the two planes must not exceed 0.8 millimeter ($\frac{1}{32}$ inch) in 610 millimeters (24 inches).

(b) The fishplates shall be cut in the length stipulated by the buyer and must not vary more than 3.175 millimeters ($\frac{1}{8}$ inch).

(c) All the fishplates must be perforated at a temperature of 800° C. (1,470° F.).

(d) All of the holes for the bolts must be perforated in only one operation without deforming their section and the fishplates must be perforated for the spikes, if required, in accordance with the designs, in one operation. There shall be permitted a variation of 0.8 millimeter ($\frac{1}{32}$ inch) from the dimensions and location of the holes.

(e) All of the fishplates must be rolled smooth, similar, accurate, and free from cracks and other defects and all the angles must be precise.

(f) The name and the mark of the manufacturer, the class of material, and the year of its manufacture must be shown in relief on the side of the rolled bars. The number of the castings shall be stamped on each fishplate.

7. *Inspection.*—The fishplates of each casting must be piled up separately until tested and inspected by the agent of the buyer. One piece for the traction test shall be selected by the inspector (from each casting representing finished fishplates or a sample for traction tests selected by mutual agreement and cut from one rolled fishplate). The inspector shall select at least one fishplate for the bending test for each 1,000 fishplates.

SPECIFICATIONS FOR IRON FOR BOLTS

1. *Manufacture.*—The material must be made entirely of puddled iron, without any mixture of old iron or steel.

2. *Definition.*—The term old iron is applied only to old iron bought or secured from other firms and not to the local products of the factory which are not mixed with old iron bought or originating from other firms.

3. *Physical properties and tests.*—The iron must satisfy the following requirements as regards tension properties:

Breakage load at a tension of the following in kilograms	
per square millimeter.....	34. 3-37. 1
Limit of elasticity.....breakage load..	0. 06
Elongation in 203 millimeters.....per cent..	25
Reduction, minimum area.....do.....	40

The apparent limit of elasticity shall be determined by the fall of the arm of the testing machinery. The speed of the cross-bar of the machine must not exceed 19 millimeters ($\frac{3}{4}$ inch) per minute.

4. *Bending test.*—(a) Cold: The test piece should be bent, cold, through 180° around a rod with a diameter equal to that of the test piece, without breaking on the outside of the bent part.

(b) Hot: The test piece heated to a bright cherry red color (980° C.) must be bent through 180° on itself without breaking on the outside of the bent portion.

(c) Reduced area: The test piece notched for 25 per cent of its extent for round bars and one whole side for flat bars, with an edged tool of 60° up to a depth of not less than 8 per cent nor more than 16 per cent of the diameter or thickness of the said test piece and subsequently broken must show an entirely fibrous fracture.

(d) The bending tests may be performed by pressure or by blows.

5. *Corrosion test*.—The straight section of the test piece shall be smoothed and polished and treated with acid until its structure is seen. The structure must show no steel.

6. *Test pieces*.—(a) The samples for the tension and bending tests must, if possible, have the original diameters; otherwise, the material must be machined in its rough state, and the axis of the sample must coincide with the axis of the undressed bar.

(b) The corrosion test samples must have the same straight section as the raw material.

7. *Number of tests*.—(a) All bars of the same size must be stacked separately. From each shipment of 100 bars or less, the inspector shall select a sample at random and send it to the Sección Pruebas of the Departamento de Materiales for the prescribed tests.

(b) If any test piece taken from a stack of bars shows any surface defects not visible before the test, or if a tension test piece breaks at a distance from its extremity less than one-third of its length, the said bar shall be rejected and another piece may be tested.

8. *Diameter variations permitted*.—The bars, as regards their diameter, must conform to the standard size limits adopted by the M. C. B. of the United States shown in the following table:

Nominal diameter		Large sizes, maximum limit		Small sizes, minimum limit		Variations, total	
Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches
6.35	$\frac{1}{4}$	6.48	0.2550	6.22	0.2450	0.25	0.010
7.94	$\frac{5}{16}$	8.08	.3180	7.80	.3070	.28	.011
9.53	$\frac{3}{8}$	9.68	.3810	9.37	.3690	.30	.012
11.11	$\frac{7}{16}$	11.28	.4440	10.95	.4310	.33	.013
12.7	$\frac{1}{2}$	12.88	.5070	12.52	.4930	.36	.014
14.3	$\frac{9}{16}$	14.48	.5700	14.10	.5550	.38	.015
15.9	$\frac{5}{8}$	16.08	.6330	15.67	.6170	.41	.016
19.1	$\frac{3}{4}$	19.27	.7585	18.83	.7415	.43	.017
22.2	$\frac{7}{8}$	22.45	.8840	22.00	.8660	.46	.018
25.4	1	25.64	1.0095	25.16	.9905	.48	.019
28.6	$1\frac{1}{8}$	28.83	1.1350	28.32	1.1150	.51	.020
31.8	$1\frac{1}{4}$	32.02	1.2605	31.48	1.2395	.53	.021
34.9	$1\frac{3}{8}$	35.20	1.3860	34.65	1.3640	.56	.022
38.1	$1\frac{1}{2}$	38.39	1.5115	37.81	1.4885	.58	.023
41.3	$1\frac{5}{8}$	41.68	1.6370	40.97	1.6130	.61	.024
44.5	$1\frac{3}{4}$	44.77	1.7625	44.13	1.7375	.64	.025
47.6	$1\frac{7}{8}$	47.96	1.8880	47.29	1.8620	.66	.026

9. *Workmanship*.—The bars must be evenly rolled and contain no chippings, depressions, sharp edges, worn ends, or signs of burning.

10. *Inspection*.—The inspector representing the company must remove the samples, according to the methods specified, as soon as he has satisfied himself that the shipment complies with the conditions relative to workmanship and dimensions.

11. *Rejection*.—(a) All bars of the same size shall be rejected if the test pieces selected therefrom, as provided for, do not comply with the requirements.

(b) The contractor may not enter a claim one month after he has been notified that the goods were rejected.

12. *Charges*.—Freight charges, drayage, etc., for the rejected material shall be for the account of the contractor.

SPECIFICATIONS FOR IRON AND STEEL PIPES FOR BOILERS

1. *General remarks*.—These specifications refer to all steel and iron boiler pipes, without seams and soldered by covering, superheated pipes, bent pipes, and safety heads for locomotive and stationary engine boilers.

2. *Manufacture*.—(a) The steel must be made by the open-hearth system.

(b) The iron must be made with charcoal and refined and hammered.

3. *Chemical properties and tests.*—(a) The steel must satisfy the following requirements as regards its chemical composition:

	Locomotive pipes	Stationary engine boiler pipes
Coal.....	<i>Per cent</i> 0.08-0.18	<i>Per cent</i> 0.08-0.18
Manganese.....	.30- .60	.30- .50
Phosphorus, maximum.....	.04	.04
Sulphur, maximum.....	.045	.045

(b) Analysis: The shavings for the chemical analysis shall be obtained by means of a 15-millimeter (5/8-inch) drill from different places around a physical test specimen.

No chemical analysis is required for iron pipes.

PHYSICAL PROPERTIES AND TESTS

4. *Iron and steel pipes.*—Hydrostatic test for locomotive and stationary engine pipe: Pipes with a diameter of less than 127 millimeters (5 inches) must stand a hydrostatic pressure of 70.3 kilograms per square centimeter (1,000 pounds per square inch), and pipes with a diameter of 127 millimeters or more, must stand an internal hydrostatic pressure of 56.2 kilograms per square centimeter (800 pounds per square inch) provided that the internal force does not exceed 1,125 kilograms per square centimeter (16,000 pounds per square inch), in which case the test pressure shall be determined by the following formula:

$$P = \frac{2,250 e}{D}$$

P =pressure in kilograms per square centimeter.

e =thickness of the pipe in millimeters.

D =internal diameter of the pipe in millimeters.

The pipes soldered by covering shall be struck near their extremities while under pressure with a 1-kilogram hammer or its equivalent.

5. *Steel pipe.*—(a) Flange test by locomotive or stationary engine boiler pipes: From pipes with a diameter of 152.4 millimeters (6 inches) or less, and a thickness less than 9 per cent of the outside diameter, there shall be cut a test piece 102 millimeters (4 inches) long and a flange shall be formed by bending the edges at a right angle to the body of the pipe. The material must not crack or split during this operation. The width of this flange measuring from the outside of the pipe, must not be less than 15 per cent of the outside diameter, but must never exceed 12.7 millimeters (one-half inch).

(b) For this test the use of the block and expander is recommended.

6. *Crushing test—for locomotive.*—(a) From all pipes excepting the small and superheated types for which the flange test is not required, there shall be cut a test piece 76 millimeters (3 inches) long. This piece shall be crushed and must not crack or split between parallel sheets until the distance between the latter is more than four times the thickness of the side. In the case of pipes soldered by covering care must be taken that the maximum flection does not occur at the soldered part.

(b) From small and superheated pipes not requiring a flection test, there shall be cut a test piece 76 millimeters (3 inches) long, which shall be crushed without splitting or cracking between parallel sheets until the distance between the latter exceeds four times the thickness of the side.

For stationary engines.—(a) From all pipes excepting the small and superheated types not requiring a flection test, there shall be cut a test piece 76 millimeters (3 inches) long. This piece shall be crushed until the distance between the sides is equivalent to three times the thickness of the material without cracking or splitting. For pipes soldered by covering, the test shall be performed without soldering at the point of maximum flection.

(b) From small and superheated pipe not requiring a flection test, there shall be cut a test piece 76 millimeters (3 inches). This piece shall be crushed until the distance between the sides is equivalent to twice the thickness of the material without splitting or cracking.

7. *Compression tests.*—(a) From all pipe except the superheated type, there shall be cut a test piece 63.5 millimeters (2½ inches) long. This piece shall be compressed longitudinally and must not crack or split until the edges are in contact.

(b) From superheated pipes there shall be cut a test piece 63.5 millimeters ($2\frac{1}{2}$ inches) long. This piece shall be compressed longitudinally until it reduces its length to 31.8 millimeters ($1\frac{1}{4}$ inches) without cracking or splitting.

8. *Iron pipe.*—Flange test—for locomotive and stationary engines: In the case of all pipe with a diameter of 152.4 millimeters (6 inches) or less, and whose material has a thickness of less than 9 per cent of the outside diameter, there shall be prepared a test piece with a flange at a right angle to the length of the pipe without showing any cracking or splitting. This flange measured from the outside shall not be less than 10 per cent of the outside diameter but must not exceed more than $\frac{1}{2}$ inch in width.

9. *Crushing test.*—For stationary engines: A test piece 76 millimeters (3 inches) long shall be crushed until the distance between its sides is equivalent to three times the thickness of the material without showing cracks or splits. An exception is made in the case of small superheated pipes not requiring the flange test. The latter pipes must be crushed to twice the thickness of the material. In the case of pipes soldered by covering, the test shall be made with the soldering at the point of maximum flexion.

10. *Bending test—locomotives.*—(a) Test with tempered strips: Strips 12.7 millimeters ($\frac{1}{2}$ inch) wide and 152 millimeters (6 inches) long removed from brushed pipe in a longitudinal direction, heated to a cherry red, and immediately cooled in water, the temperature of which must be 21° C. (80° F.) shall be bent in an opposite direction to the two extremities and must not split or crack.

(b) Test with notched strips: Strips 12.7 millimeters ($\frac{1}{2}$ inch) wide and 152 millimeters (6 inches) long, removed from brushed pipes in a longitudinal direction, notched and split by light blows, must show entirely fibrous fractures.

11. *Expansion test—locomotives.*—A test piece of 305 millimeters (12 inches) shall be heated for a length of 127 millimeters (5 inches) to a bright cherry red, that is between 667° and 778° C. ($1,200^{\circ}$ to $1,400^{\circ}$ F.) and placed vertically. After this operation a smooth pointed steel rod heated to the blue point, that is between 330° and 440° C. (600° to 800° F.) shall be forced into the extremity of the pipe either by pressure or by light blows with a 4.5-kilogram (10-pound) hammer. The pipe tested in this manner must widen for as much as one and one-eighth times its original diameter without breaking open or splitting. The rod must be made of tool steel with a conicity of from 1 to 8.

12. *Compression test—locomotives.*—The test piece 63.5 millimeters ($2\frac{1}{2}$ inches) long may be compressed longitudinally until it reaches a length of 28.6 millimeters ($1\frac{1}{8}$ inches) and must not break open in any direction. The soldering must not split or break open.

13. *Corrosion test—locomotive and stationary engines.*—In case of doubt as to the quality of the material the following test shall be performed to determine the presence of steel: The upright section of the pipe shall be well machined and polished and treated with acid. The soft parts of the surface will then present an appearance whereby they will be so dissolved as to show the contexture of the material with the soldering well defined, whereas the steel pipe will have a uniform surface.

14. *Samples.*—The pipe shall be divided by sizes into lots of from 250 to 400 according to quantities.

Two samples shall be selected from each group, each piece to be 457 millimeters (18 inches) long, both for iron or steel pipes. The inspector shall select the pipes at random.

15. *Test pieces.*—The extremities of the test pieces must be filled and all of them except those specified for the expansion test (art. 11) must be tested at a temperature of from 60° to 100° F. (15° to 37.7° C.).

16. *Number of tests—Locomotives.*—Steel: One of the physical tests specified shall be performed with each one of the two test pieces of the respective lots.

Iron: One of the physical tests specified shall be performed with each one of the two test pieces of the respective lots.

17. *Laboratory.*—The test shall be performed at the laboratories of the Sección Pruebas when the material is received at the warehouse.

18. *Standard weights for steel pipe.*—The standard weights are specified for steel pipe.

19. *Variations in weight.*—The weight of the pipes must not vary more than 5 per cent from the weight specified.

20. *Standard weights for iron pipe.*—Standard weights are specified for iron pipe.

21. *Workmanship.*—(a) Finished pipes with an outside diameter of 89 millimeters ($3\frac{1}{2}$ inches) or less must not deviate from the circular shape by more than 0.51 millimeter (0.02 inch), and their average outside diameter must not

differ from the diameter ordered by more than 0.381 millimeter (0.015 inch). For pipes with an outside diameter greater than 89 millimeters these differences must not exceed 0.5 per cent of the outside diameter.

The thickness should not at any point vary more than 10 per cent from the specified thickness except at the soldering of the iron pipes, where an additional thickness of 0.381 millimeter (0.015 inch) shall be allowed.

In the case of pipes which are expanded and given the shape of a flange, the thickness of the enlarged extremity may be less than the stipulated thickness by as much as $1\frac{1}{2}$ units of the B. W. G., and the thickness of the compressed extremity may be greater than the stipulated thickness by as much as 2 units of the same scale.

(b) The pipes may not be shorter but they may exceed the specified length by 3.17 millimeters (0.125 inch).

22. *Finish*.—The pipes must have no defects or deformities and must show careful finishing work.

23. *Marks*.—Each pipe must be engraved with the mark or name of the manufacturer, lot number, kind of material (steel or iron), and the pressure in pounds at which the pipe was tested in the factory.

24. *Rejection*.—(a) All the pipes of any size or class of a shipment shall be refused if 50 per cent of the test pieces selected therefrom do not satisfy the test requirements. If less than 50 per cent of the test pieces are unsatisfactory, there shall be rejected only the particular lot represented by those test pieces.

(b) All pipe of any size or kind showing defects upon being placed shall be refused and returned to the manufacturer.

25. *Claims*.—The samples of the rejected material shall be kept for one month after notice has been submitted of their refusal. After that time the manufacturer or contractor loses his right to enter claim.

26. *Charges*.—All freight and transportation charges, etc., for the rejected material shall be for the account of the manufacturer or contractor.

SPECIFICATIONS FOR RAIL SPIKES

1. *General remarks*.—These specifications refer to the purchase of rail spikes for the State Railways, according to the standards of the American Railway Engineering Association.

2. *Material*.—The steel must be prepared by the open-hearth process or any other approved method. If necessary, to assure the desired properties, the spike may be tempered.

3. *Physical properties and test*.—The rail spikes must conform to the following requirements: Resistance to fracture not less than 38,665 kilograms per square millimeter (55 pounds per square inch); limit of elasticity in less than 50 per cent of the resistance to friction; expansion not less than 20 per cent in 50.8 millimeters (2 inches); contraction not less than 40 per cent.

It must be possible to bend the test piece while cold 180° over itself and to hammer it without producing any signs of breakage.

The head shall be flattened by hammer blows in the direction of the length of the spike and must not show any signs of breakage.

The stem of the spike shall be bent while cold one and one-half times and must not show any signs of breakage.

A sufficient number of tests must be performed to satisfy the inspector that the material complies with all the provisions of the specifications.

4. *Make and finish*.—The shape and dimensions of the spike, subject to the following tolerances, must conform with the patterns submitted to the manufacturer. The thickness must not vary more than 0.8 millimeters ($\frac{1}{32}$ inch) from the stipulated dimensions. The length of the spike measured from the lower part of the head to its extremity must not vary neither more nor less than 6.35 millimeters ($\frac{1}{4}$ inch) from the stipulated dimensions.

The thickness of the head must not vary more than 1.59 millimeters ($\frac{1}{16}$ inch) from the dimensions indicated.

A variation of 1° shall be allowed for the angle as specified at the lower side of the head.

The spikes must be well finished, free from seams and sharp edges and their heads must be well shaped and the points sharp.

5. *Inspection*.—If necessary, the manufacturer must furnish samples of spikes of a preliminary rolling before proceeding to fill the order and give sufficient notice of the date on which these samples will be ready for inspection.

The inspectors representing the buyer shall, during the life of the contract, have access to all parts of the factory connected with the manufacture of the

material ordered. The inspection shall be performed at the place of manufacture and the manufacturer shall give inspectors gratuitously all necessary material so that they may assure themselves that the spikes are made and shipped in accordance with these specifications.

All tests and inspections must be performed in such a manner as not to interrupt the operation of the factory.

The testing of finished products shall be made from samples selected by the inspector from each lot of 100 packages.

For each test there shall be selected two test pieces and if both fulfill the requirements of the specifications the lot shall be received. If one of the test pieces is unsatisfactory, a third shall be selected and tested. If the third piece complies with the requirements of the specifications, the lot shall be received. If the third piece does not comply with the specifications, the entire lot shall be refused.

If after the spikes are shipped, it is proved that they are defective as regards the material or its manufacture, the spikes may be refused.

6. *Marks and shipping.*—The spikes must be packed in such a manner that their shipment will be safe. All packages must be marked by showing the material, the dimensions of the spikes, and name of the manufacturer.

SPECIFICATIONS FOR STEAM SUPERHEATER EQUIPMENT

1. *General remarks.*—These specifications refer to the purchase of superheating equipment for use on the locomotives of this company.

2. *Types.*—The company will in all cases specify the type of superheater desired.

3. *Heads.*—(a) The material for the superheater heads must be of compact cast steel with a steel content properly computed to obtain a resistance to fracture of not less than 20 kilograms per square millimeter.

The cast pieces must be absolutely steam proof and will not be accepted if treated with ammonium salt or some other oxidizing agent or covering preparations. To obtain the most homogeneous material for the connection surfaces of the various parts, the heads must be cast with the connection surface placed downward. Special care must be exercised in preparing the models and molds and also in the location, size, and height of the outlets and valves. Parchment lids or chaplets shall not be permitted for the conical coupling of the head to the tube.

(b) *Planing.*—The connecting surface shall be planed to the dimensions indicated in the sketches. The connection holes at the coils of tubes shall be drilled and carefully rectified with a reamer.

The conical coupling supports shall be emery ground to 45° and coupled in such a way that the spherical part of the tube connection with the pipe has its line of contact with the center of the face at 45° from the head.

(c) *Tests.*—The cast pieces must not show any filtration under a hydrostatic pressure of 24.5 kilograms per square centimeter (350 pounds per square inch). The pressure test must be performed separately and independently with the saturated steam container and the superheated steam container.

The partition separating these compartments must be in good condition with no signs of blastings and no porous appearance.

(d) *Marks.*—Each head must show in raised cast letters the series number, and the model number, which must not be planed. For these marks, the vertical partition in front of the superheated steam container shall be preferred.

4. *Parts.*—(a) *Material.*—The material shall be steel tubes, not soldered, of the specified diameter and of the No. 10 B. W. G. thickness. It must also be subjected to all the tests mentioned in specifications No. 8 of this company.

(b) *Manufacture.*—Each unit shall consist of four tubes connected by double bends forged by the Elesco process or some other process approved by the company. They must also conform to the proper plans. The double bends shall be entirely forged on the tube and no soldering with oxygen or electricity or any other system adding more material at the bend shall be acceptable. The bent tubes must have their spherical coupling extremities forged by the three operation system.

The tubes shall be kept in position by means of supports and coupling bands in accordance with the plans of the company.

No bend of the tubes must have a smaller radius than that indicated, and it must not be flattened more than 2.4 millimeters ($\frac{3}{16}$ inch) as a maximum at any point of the bend.

(c) Each complete unit of tubes must stand a hydrostatic pressure of 35 kilograms per square centimeter (500 pounds per square inch) without showing filtra-

tions. The units shall be struck light blows with a copper hammer during the pressure.

(d) *Accessories*.—The various bolts used must be stamped according to the plans of the company.

The supports of the coils, bands, and spacers must also be made strictly in accordance with the respective plans.

5. *Foundation bolts for the parts*—(a) *Physical properties*.—These bolts must be made of steel with the following characteristics:

Minimum breaking load.....kilograms per square millimeter..	70
Limit of elasticity.....do.....	52
Elongation in 50.4 millimeters.....per cent..	18

The nuts must be able to stand the necessary load to operate the bolt up to its limit of elasticity.

(b) *Tests*.—The test pieces for the tension tests shall be removed from certain bolts, which, as to their shape and size, must be the same as prescribed by the A. S. T. M. for rail bolts.

One tension test shall be performed for every 100 bolts. If the material of any test piece shows defects in its manufacture or other imperfections, the test piece may be discarded and another specimen selected.

If the results of the tension test with any test bolt does not conform with the specifications, four other specimens shall be selected, all of which must test satisfactorily. If one of the bolts does not give satisfactory results, the entire shipment shall be refused.

(c) *Workmanship*.—The bolts must be of the dimensions indicated, with smooth edges and well shaped, with no cracks or defects of any kind. The head must be concentric with the stem of the bolt, with its lower extremity at right angles with the stem.

The threads must be well made, neat, and conform with the specifications. A deviation from the dimensions of 0.4 millimeter ($\frac{1}{64}$ inch) more or less shall be permitted.

The finished bolts must have a good appearance and be free from all defects.

The nuts must be stamped, hexagonal, to be screwed on the bolt by hand.

6. *Inspection*.—The company inspector shall have free access to all parts of the factory during the life of the contract. The manufacturer must furnish, free of cost, all the bolts and material needed for the tests, which shall be performed on the factory premises in accordance with the specifications.

Official copies of these tests shall be delivered to the inspector, who must submit them to the Sección Pruebas in Santiago.

7. *Automatic regulator*.—The automatic regulator (damper) must conform with plans approved by the company.

8. *Rejections*.—Material showing manufacturing defects after its acceptance at the factory shall be rejected and must be replaced free of charge by the contractor.

SPECIFICATIONS FOR MATERIALS, TOOLS, AND INSTRUMENTS (TELEGRAPH, TELEPHONE, SOUNDERS, AND CLOCKS)

No. S. T. F. 508.—*Double-petticoat insulator for telegraph and telephone lines of long distance, suitable for carrying wires up to No. 8 S. W. G. or its equivalent*

The insulators shall be of the double-petticoat type, made of well-baked porcelain, so they may be thoroughly and perfectly vitrified, or of glass or any other suitable material. The length of the inside cup shall be at least one-eighth inch less than the length of the outside cup.

The insulators must be of high insulation power and high resistance to tension and compression; they must have an even area of compact contexture, homogeneous, and without irregularities. All insulators shall have an inside screw thread for screwing in steel thimbles, with wood thread of six threads per inch and five-eighths inch diameter.

Along with the bid, a diagram of the dimensions of the insulator offered must be submitted, or else a sample of it; in addition, data for verifying the electric rupture point through discharge into the insulator.

The insulators must be packed in kegs or other appropriate containers to prevent possible breakage.

Test.—They are to be subjected to the following test: To an artificial precipitation equivalent to 2.5 cubic centimeters of daily precipitation, for three days, tested with a megger of 1,000 volts, giving more than 2,000 megohms in complete

form, and the corresponding decrease to the external cup completely broken shall yield less than 50 per cent of the resistance stated.

No. S. T. F. 509.—*Double-petticoat insulator for local short-distance telephone lines suitable for carrying iron wire up to No. 14, S. W. G. or its equivalent. The insulators shall be of the double-petticoat type, made of vitrified porcelain, vitrified clay, glass, or other appropriate material*

The insulators shall be of high insulation power and high resistance to tension and compression. They shall have a smooth surface, shall be of compact, homogeneous contexture, without any irregularities. All insulators shall have an inside screw thread for screwing in steel thimbles, with wood thread of six threads per inch and five-eighths inch in diameter. The insulator must be of the kind that will permit of seven full threads.

Along with the bid there must be submitted a diagram showing the dimensions of the insulator offered, or else a sample of the insulator, together with the details of verification of the electric rupture point through discharge into the insulator.

The insulators shall be forwarded well packed in kegs or other appropriate containers to guard against breakage.

Test.—They shall be subjected to the following test: To an artificial rain equivalent to 2.5 centimeters of daily precipitation for three days, tested by a megger of 1,000 volts, giving more than 2,000 megohms in complete form and the corresponding decrease in the external cup completely broken, leaving less than 50 per cent of the resistance stated.

Galvanized-iron wire for aerial lines.—No. S. T. F. 1510: 400 pounds per standard mile for long-distance telegraph lines.—No. S. T. F. 1511: 200 pounds per standard mile for telegraph lines up to 50 kilometers in length.—No. S. F. 517: 100 pounds per standard mile for telephone lines of short-distance local circuits

GENERAL SPECIFICATIONS

The galvanized iron shall be of sufficient softness and resistance to torsion so as to permit of increasing its length by 15 per cent without breaking.

The wire must not break when subjected to a tension, equivalent to the total weight of two and one-half times its own weight per mile.

The wire must be subjected to the following torsion tests: Some pieces of wire shall be held, each by two separate clamps, at a distance of 6 inches apart, and after having been twisted at least 15 times, the twists (torsions) must be visible to the eye in each piece between the clamps.

The wire must be of uniform quality, symmetrical, and without defects.

The wire must be well galvanized. It shall be subjected to the following test: From each 100 rolls of wire, select five pieces, each 6 inches in length, submerge these pieces in a saturated solution of copper sulphate for about 70 seconds; remove them and wipe thoroughly with an appropriate rag. This immersion shall be repeated four times. If after the fourth immersion the wires are of black color the same as that after the first immersion, it shall prove that the wire has been duly galvanized. But in case the wires appear to be copper covered, the part subjected to the test shall be rejected. The wire must have the characteristics indicated in the following table:

Type of wire, in pounds per mile	Weight shall not exceed—	Weight shall not be less than—	Diameter shall not exceed—	Diameter shall not be less than—	Minimum break tension shall not be less than—	When the actual wire diameter shall have been reduced by calculation to the standard diameter per mile, its resistance in ohms per mile must be—
	Pounds	Pounds	Millimeters	Millimeters	Kilograms	
400	420	380	175	167	500	13.32
200	210	190	125	118	270	26.64
100	105	95	87	31	120	53.28

They shall show no alligation nor juncture; further, each roll must be properly protected, carrying a label, bearing data regarding its size, weight, date of manufacture, etc.

No. S. T. F. 1519.—*Galvanized iron wire for cables, of 60 pounds per mile*

The wire shall be of galvanized iron, very soft, of uniform thickness and even throughout its full length, symmetrical, and free from any defects.

Galvanizing shall be subjected to the following tests: From each 50 rolls of wire select 5 pieces each 6 inches long; submerge the pieces into a saturated solution of copper sulphate for 70 seconds; take them out and thoroughly clean them with an appropriate rag. This operation is repeated twice, and if after the last immersion the wires are of black color equal to or the same as after the first immersion the proper quality of galvanization shall have been verified; but if the wires show signs of being copper covered, that part under test shall be rejected.

The wire diameter shall not be less than 64 thousandths of an inch nor more than 68 thousandths of an inch.

The wire must resist 25 torsions (twists) in 3 inches in length, without breaking.

The wire shall be forwarded in rolls of 5 pounds each; they shall not bear any alligation nor junctures.

Every roll shall be forwarded properly protected, bearing a label with all details regarding type, weight, and date of manufacture.

No. S. T. F. 510.—*Copper wire for telephone lines, of 100 pounds per mile*

The wire shall be of uniform size and even throughout its full length, symmetrical, and free from all defects; it shall be inspected for appearance and caliber-gauge.

The wire shall have the following characteristics: Its weight per mile shall not exceed 102 pounds nor be less than 98; its diameter in thousandths of an inch shall not exceed 80 nor be less than 78; its minimum breaking tension shall not be less than 330 pounds; in any sample chosen for torsion tests, the number of torsions in a section 3 inches in length, freely held between two clamps, shall not be less than 30 before the wire breaks. When the wire diameter shall have been reduced by computation to the standard diameter per mile, its resistance per mile must be 8.7873 ohms at a temperature of 60°F.

The wire shall be packed in rolls of 120 pounds each; they shall bear neither alligation nor junctures. Each roll must be forwarded properly packed in impermeable paper, bearing its corresponding label with details of its type, quality, weight, tests, and date of manufacture.

No. S. T. F. 510.—*Copper wire for telephone lines, of 150 pounds per mile*

The copper wire shall be of uniform quality, even throughout its length, symmetrical, and free from all defects. It shall be inspected for appearance and for caliber-gauge.

The wire shall have the following characteristics: Its weight per mile shall not exceed 153 pounds nor be less than 147; its diameter in thousandths of an inch shall not exceed 98 nor be less than 96 thousandths; its minimum breaking tension shall not fall below 490 pounds; in every sample chosen for torsion tests the number of twists in a section 3 inches long, between two clamps, before breaking, shall not be less than 25. When the actual wire diameter shall have been reduced by computation to the standard diameter per mile, its resistance per mile shall be 5.8582 ohms at a temperature of 60° F.

No. S. T. F. 540.—*Hardened bronze wire of 40 pounds per mile (11.274 kilograms per kilometer)*

The wire shall be of uniform quality, symmetrical, and without defects. It shall have the following characteristics: Its weight in pounds per mile shall not exceed 41 nor be less than 39; its diameter in thousandths of an inch shall not exceed 50.5 nor be less than 49.25; its minimum rupture tension in kilograms shall not be less than 89; when the present wire diameter shall have been reduced by computation to the standard diameter per mile, its resistance per mile shall be 45.5 ohms.

The wire shall be subjected to the following torsion test: A piece selected from each 20 rolls of wire shall be placed between two clamps 3 inches apart, and shall be twisted 20 times, and shall not break under this test.

No. S. T. F. 511.—*Copper wire for telephone lines, of 150 pounds per mile*

The wire shall be of uniform quality, even throughout its length, symmetrical, and free from any defects. It shall be examined for appearance and for caliber-gage.

The wire shall have the following characteristics: Its weight per mile shall not exceed 153 pounds nor be less than 147; its diameter in thousandths of an inch shall not exceed 98 nor be less than 96; its minimum breaking tension shall not be below 490 pounds; in any sample selected for torsion test, the number of torsions in a piece 3 inches long between two clamps shall not be less than 25 before rupture. When the actual diameter of the wire shall have been reduced by computation to the standard diameter per mile, its resistance per mile shall not be less than 5.8582 ohms at a temperature of 60° F.

The wire shall be packed in rolls of 120 pounds each without alligations or junctions. Each roll shall be shipped properly packed in impermeable paper, bearing a corresponding label with details as to type, caliber, weight, tests, and date of manufacture.

The wire shall be packed in rolls, each weighing at least 9 kilograms; they shall bear neither alligation nor juncture; each roll must bear a label with data as to its size and weight.

No. S. T. F. 1516.—*Covered copper wire, simplex, for telegraphy*

The wire shall be of the No. 18 S. W. G. or the number nearest to the next caliber, covered, of tinned soft copper, of uniform quality, symmetrical, and without defects; a variation of 2 per cent only shall be allowed in the weight of the copper, computed to be equivalent to the caliber of the conductor used. The wire shall be covered with vulcanized rubber and with a double lining of braided cotton, impregnated with an impermeable compound; it shall correspond to the class of 600 megohms per mile.

The tolerance in the conductivity of the copper used in the wire shall be 4 per cent, computed on the basis of indications given in the following paragraph:

In theory, all the copper contained in the wire shall be reduced to a section of a square millimeter and each meter of wire of such section must have a resistance of 0.01724 ohms.

The wire must come in rolls, each 100 meters long, without alligations or junctions.

No. S. T. F. 500.—*Copper wire lined, duplex, for telephones*

This shall consist of two wires of No. 18 S. W. G., or the number nearest to the next caliber, twisted, each one lined, of tinned soft copper, of uniform quality, symmetrical, and without defects; a variation of 2 per cent is allowed in the weight of the copper, computed to be equivalent to the caliber of the conductors used. Each wire of the two (pair) shall be lined with vulcanized rubber and with a double coating of braided cotton impregnated with an impermeable compound; it shall correspond to the class of 600 megohms per mile.

The tolerance in the conductivity of the copper employed in the wire shall be 4 per cent, computed on the basis stated in the following paragraph:

In theory, all the copper contained in the wire shall be reduced to a section of 1 square millimeter, and each meter of wire of such section shall have a resistance of 0.01724 ohms.

The wire must arrive in rolls, each 100 meters long, without alligations or junctions.

No. S. T. F. 1070.—*Covered wire for zinc terminals*

It shall be of soft copper with 98 per cent conductivity, tinned, No. 17 S. W. G. or its equivalent; it shall be lined with a covering of braided cotton and impregnated with a protective compound to safeguard it against the action of ammonium salt used in Leclanche piles. The price shall be quoted per meter.

ENAMELED WIRE

The wire shall be of soft copper with a covering of enamel; it shall have the following characteristics:

Specification number	Diameter in millimeters			Resistance up to 15.55° C. per kilogram
	Bare	Outside	Increase	
S. T. F. 1,000.....	0.1	0.108	0.008	29,330
S. T. F. 1,001.....	.2	.22	.02	1,825
S. T. F. 1,002.....	.3	.32	.02	290
S. T. F. 1,008.....	.4	.43	.03	115

The enamel shall be uniform and resistant, but clinging well to the wire; it shall be proof against organic fluids, diluted acids, and alkaline liquids; and per millimeter of insulation proof against the tension of 1,000 volts.

The wire shall be shipped in appropriate boxes.

No. S. T. F. 2000.—*Lined copper wire for bells*

The wire shall be approximately 0.75 millimeter, of soft copper, with a minimum 98 per cent conductivity. It shall be lined with two braided coverings of cotton in opposite directions and the whole saturated in paraffin wax.

The total amount asked shall be supplied in wire of two colors and shipped in rolls of a minimum length of 100 continuous meters, without alligations or junctures, and packed in impermeable material.

No. S. T. F. 505.—*Clamps for wooden arms of eight insulators*

They shall be of steel, 1 by $\frac{1}{4}$ by 14 inches long, finished and galvanized in conformity with the specifications issued by the company.

Their shapes and sizes shall be those indicated in the plan No. S. F. L. 505, S. T. L. 1505.

The holes shall be seven-sixteenths inch in diameter, and well finished.

No. S. T. F. 520.—*Cast-iron accessorial elbow, galvanized, with inside insulating protection to carry the line wire to the aerial thread in terminal poles*

It shall conform to the plan No. S. F. L. 520. It shall be of galvanized cast-iron on the outside. It shall carry inside an insulating lining, projected from both ends of the elbow, but not more than 1 centimeter at each end.

No. S. T. F. 521.—*Anchors for pole brace rods, of three-eighths inch galvanized iron*

The anchor shall be of malleable iron, round, three-eighths inch in diameter, galvanized in conformity with the company's specification.

The anchor shall be of two parts, the bar and the arc. The bar shall be 6 feet long with double square head, finished at one end; at the other end it shall be taped over a length not less than 2 feet with Whitworth thread. Each bar shall have a square rim, 3 by 3 by $\frac{1}{8}$ inch, duly perforated to unite it with the square part of the bar, immediately below the chief head, and shall have a hole so as to permit of its being fastened to the wood to prevent displacements when the hexagonal nut presses against the base of the arc. In addition, the bar shall carry a hexagonal nut of such form that when pressure is exerted against the base of the arc, the nut shall not be loosed. The arc shall be of malleable iron, galvanized, three-eighths inch in diameter, to conform to the bar and shall be secured in a base of malleable iron.

The thread of the bar shall be shipped, treated with an appropriate composition to protect it against oxidation. The anchor must be able to bear a minimum rupture weight of 1,650 kilograms. A sample or plan with sizes and complete details must accompany the bid.

No. S. T. F. 522.—*Anchor for pole brace rods of galvanized iron, five-eighths inch*

The anchors must be of malleable iron, round, five-eighths inch in diameter, galvanized according to the company's specifications. The anchor shall be in two parts, the bar and the arc.

The bar shall be 6 feet long with double square head finished at one end. The other end shall be taped over not less than 2 feet with Whitworth thread. Each bar shall bear a square rim measuring $3\frac{1}{2}$ by $3\frac{1}{2}$ by $\frac{1}{8}$ inch, duly perforated to unite it with the square part of the bar immediately below the principal head, and shall have a hole permitting it to be fastened to the wood to prevent displacements when the nut presses against the base of the arc. In addition, the bar shall bear a hexagonal nut of such form that on pressure being exerted against the base of the arc, the nut shall not become loose.

The arc shall be of malleable iron, galvanized, five-eighths inch in diameter, to correspond to the bar and shall be secured to an appropriate base of malleable iron. The thread of the bar shall be shipped, treated with an appropriate composition to protect it against oxidation.

The anchor must be able to bear a minimum rupture weight of 4,500 kilograms. A sample or plan, with indicated sizes and complete details, must accompany it.

No. S. T. F. 27.—*Induction coils for telephone apparatus*

The core shall be of soft, Swedish iron, in accordance with the best practice in the matter. The coil itself shall be by preference of enameled copper wire, proof against humidity.

The ratio of the turns of the secondary coil to the primary coil shall not be more than 5 nor less than 4 to 1, and the ratio of the ohmic resistance of the wire forming the secondary to the ohmic resistance of the primary coil shall be between 100 and 200 to 1. The ends of the coils shall be in fixed terminals located in the arms of the bobbins. The total length of the bobbin with its two arms shall not exceed 8 centimeters.

The bobbin shall be shipped insulated, so as to leave it impermeable and proof against humidity.

In addition, the bobbin shall be tested with a charge of alternate current of 1,000 volts between the primary and the secondary and between the secondary and the core.

No. S. T. F. 1019.—*Manganese dioxide*

It shall be of the commercial type and free from impurities; pulverized in such manner that it will pass through a screen of 50 meshes per inch and stay in another of 60 meshes per inch. The price quoted must be in kilograms and the article packed in kegs.

Samples must be forwarded for chemical analysis.

No. S. T. F. 541.—*Emergency cable*

Emergency cable of eight wires twisted in pairs, each wire made of tinned copper conductor, the fibers forming the conductor in the equivalent of S. W. G. No. 18, or the number nearest to the next caliber. A 2 per cent variation in the weight of the copper is permitted, calculated as equivalent to the caliber of the conductor used. Each conductor shall be covered with vulcanized rubber and huinchada(?). The entire cable shall be duly protected with lining of braided cotton saturated with an impermeable compound.

The conductivity tolerance of the copper used in the wire shall be 4 per cent of that indicated in the following paragraph:

In theory, all the copper contained in the wire shall be reduced to a section of 1 square millimeter, and each meter of wire of this section shall have a resistance of 0.01724 ohms.

The wire shall be shipped in rolls, each 500 meters long, and show neither alligations nor junctures.

No. S. T. F. 542.—*Cable of two copper wires with paper insulation and lead coating*

Cable of a pair, twisted, of copper wire, twenty-five thousandths of an inch in diameter, with paper insulation, oiled, and lead coating.

The bidder must indicate all data referring to the cable offered, together with tests of insulation, capacity, conductivity, etc.

The cable shall be shipped duly wound in parcels each not measuring less than 250 meters.

No. S. T. F. 543.—*Cable of 16 multiple pairs*

Cable of 16 multiple pairs (multiple twin) of copper wire, thirty-six thousandths of an inch in diameter, with oiled paper insulation and lead covering. The wires shall be identifiable between themselves by paper of different colors, each of such nature as to make it easy of identification. In addition, each shall be differentiated by multiple from any other.

The copper wire shall have a minimum diameter of thirty-five thousandths of an inch; the maximum resistance per standard mile, at 60° F., shall be 43.912 ohms.

In his bid, the bidder must show the insulation resistance and cable capacity and the length of the spiral of each wire and by multiple. The thickness of the lead coating with 3 per cent of tin, shall be a minimum of sixty-nine thousandths of an inch.

The cable shall be shipped duly wound and in parcels not less than 250 meters long, showing neither alligation nor juncture of any kind. The packing must conform to the specifications that the company may indicate in regard to the matter.

No. S. T. F. 525.—*Iron galvanized cable of three wires, No. 8, for pole brace-rods*

The cable shall be of three galvanized iron wires No. 8.

It shall be symmetrical and uniform over its full length, free from all manner of defects and of sufficient softness and of good resistance to torsion so that it may be increased in length by 15 per cent without breaking. The galvanization of the wire shall be in such form as to be subjected to the following test:

Take some pieces of the wire cable, each 6 inches long, and put them into a solution of copper sulphate for 70 seconds; take them out, wipe them carefully and repeat the immersion four times. If after the fourth immersion the wires are not of black color, the same as after the first immersion and they show indications of being copper covered, such part shall be rejected.

As for torsion, the wire shall be subjected to the following test:

Place a piece of wire between two clamps which are 6 inches apart and twist it at least fifteen times; the torsions must be clearly visible between the clamps and the wire must not break.

The minimum rupture weight of the cable must be 3,500 pounds.

Along with his bid, the bidder must send a sample of the cable or details referring to the length of the torsions of the wires with a complete turn in the formation of the cable.

In addition, the bidder must state the weight of each roll and the length of cable in each roll which must show neither alligation nor juncture.

The tread of the spiral shall be 8 inches.

No. S. T. F. 526.—*Galvanized iron cable, of five No. 8, for pole cross-tie*

The cable shall be of five wires of galvanized iron. The wire must be symmetrical, uniform over its entire length, free from any defects, sufficiently soft, and of sufficient resistance to doubling, so that it may be increased lengthwise by 15 per cent without breaking.

Galvanizing of the wire must be done in such manner that it may be subjected to the following test: Take a few pieces of the cable wire, each 6 inches long; put them into a solution of copper sulphate for 70 seconds; take them out and wipe carefully; repeat this four times; if after the fourth immersion the wires should not be of black color, equal to that after the first immersion, and show signs of being copper covered, that part shall be rejected.

As regards torsion, the wire shall be subjected to the following test: Take a piece of wire between two clamps, separated one from the other by 6 inches, and twist the wire at least fifteen times; the wire must not break and the torsions must be clearly visible between the clamps. The cable must bear a minimum rupture weight of 5,800 pounds.

Along with his bid, the bidder must forward a sample of the cable, or details in reference to the length of the torsions of the wires, showing a complete turn in the formation of the cable.

The bidder shall specify the weight of each roll and the length of cable in each roll; the cables must show neither alligations nor junctures.

The tread of the spiral shall be 10 inches.

No. S. T. F. 513.—*Wooden crosspieces for four insulators*

The crosspieces must be of well dried selected wood, free from knots, cracks, or any other defects that might affect the life of the crosspiece.

They must be of wood that, in addition to its general durability, will be proof against subsequent warping.

Each crosspiece as it is delivered, shall be carefully examined, and each one showing warping of any kind, or evidence of cracks, signs of decay, or any other defects that may militate against its durability, shall be rejected.

The specific name of the wood used, together with the details of its high resistance to tension and wear, shall be stated in the bid. The crosspieces shall be shipped in bundles of 10 each.

Every hole in the crosspiece shall be threaded and well finished; the surface must be smooth, not painted, and show no signs of having been treated.

The total length of the crosspiece shall be 44 by 2½ inches wide and 3 inches thick. The upper part shall have a bevel edge one-fourth inch at its two ends and along its sides for a distance of 16 inches from its ends toward the center. In the center a hole nine-sixteenths inch in diameter shall be bored from side to side.

From the upper part to the lower part shall be bored four holes eleven-sixteenths inch in diameter each for straight nuts; two of these shall be 3 inches away from the ends and the two others 15 inches away from the ends, in accordance with the dimensions of plan No. S. F. L. 513.

No. S. T. F. 514.—*Wooden crosspiece for eight insulators*

These pieces shall be of select wood, well dried, and free from knots, cracks, or other defects that might affect its durability.

They shall be of such wood as, in addition to its general durability, will be proof against any subsequent warping.

Each crosspiece, when delivered, is to be inspected, and each one that shows signs of warping, cracking, decay, or other defects militating against its durability, shall be rejected.

The specific name of the wood used for the crosspiece, together with the details regarding its high resistance to tension and shearing, must be specified in the bid.

The crosspieces shall be delivered in bundles of five each.

Every bore of each crosspiece shall be tapped and finished in proper form; all surfaces must be smooth, without paint, and not show evidences of their having been treated. The total length of the crosspieces shall be according to the plan, 3 inches wide and 3 inches thick. The details regarding those parts that are to be chamfered and the locations of the bores, shall be according to plan No. S. F. L. 514.

No. S. T. F. 506.—*Diagonal bracket for wooden crosspieces*

They shall be of steel, galvanized, ¾ by 1½ inches, according to the company's specifications, and of the form and sizes indicated in plan No. S. F. L. 506.

The bores shall be of the size indicated in the plan and must be well finished.

No. S. T. F. 1510.—*Cap to bear spike and insulator on the upper part of pole*

The cap shall be of smelted malleable steel, soft steel, or malleable iron, well galvanized, and the size shall be according to plan No. S. T. L. 1510. The caps shall be delivered in parcels of 50 each.

No. S. T. F. 41.—*Alternating current bells for local lines*

Bobbins.—The core shall be of soft Swedish iron, the wire winding with insulation, preferably of enamel, impermeable to humidity; the ohmic resistance of bobbin shall be 500 ohms at a temperature of 15.5° C. The wire used must be as thick as possible, yielding the required number of turns without increasing the size of the bobbin overmuch.

Anchor.—Of soft Swedish iron, with adjustable screws in the framing.

Frame.—It shall carry the magnet, the bobbins, and any other parts, and must be of such form as will permit adjustment of the anchor in movement and in the space up to the bobbins. The total size shall not exceed 14 by 11 by 7 centimeters. The supports for the gongs shall be adjustable so as to give plenty of play to the hammer.

Hammer.—Of metal not subject to oxidation and screwed to the anchor.

Bells.—Must be of metal proof against oxidation and blued by preference. Its diameter shall be 5 by 7.5 centimeters.

No. S. T. F. 49.—*Alternating current bells for use in the open air*

Bobbins.—The core shall be of soft Swedish iron. The wire winding with insulation, by preference of enamel and absolutely proof against humidity. The ohmic resistance of each bobbin shall be 500 ohms at a temperature of 15.5° C.

Anchor.—It shall be of soft Swedish iron with adjustable screws in the frame.

Frame.—Bearing the magnet, two bobbins, two gongs, and other parts shall be so constructed as to permit adjustment of the anchor in motion and within the space up to the bobbins. Gong supports shall be adjustable so as to give plenty of play to the hammer.

Hammer.—Of metal proof against oxidation and screwed to the anchor.

Bell.—Of nonoxidable metal, blued, if possible, and its diameter from 15 to 20 centimeters.

Metal box.—It shall be of nonoxidable metal; blued, if possible, within and without, impermeable to weather inclemencies. The lead-in for the outside wires shall be so constructed as to make it impermeable to humidity.

No. S. T. F. 165.—*Commutator key for telephone apparatus*

The commutators shall have pole terminals and the necessary brushes for connecting with the external line (or the central switchboard) with the principal telephone apparatus and the extension line; it shall offer the following services:

1. Call up and answer the principal outside telephone.
2. Call up and answer the outside extension telephone office.
3. Call up and answer between the principal telephone and the extension telephone while the external line is connected as an extension bell.

The functioning of the commutator is effected by means of a semigrating key; all connecting pole terminals shall be mounted on a proper base and covered with a protecting coat, only the key and the opening in the box necessary for its operation to be visible.

The box shall bear clear indications showing, by the position of the key, what apparatus is in operation.

The bids must be accompanied by a diagram or a proper sample.

No. S. T. F. 176.—*Commutator key for three telephone apparatuses*

The commutators shall have pole terminals and proper springs for making connections with the outside lines (or the central office), and the chief apparatus and the extension telephone apparatus No. 1 and No. 2, to afford the following services:

1. To call up and answer calls over the chief outside telephone.
2. To call up and answer calls over the outside extension telephone No. 1.
3. Call up and answer calls over the outside extension telephone No. 2.
4. To call up and answer calls between the chief telephone and the extension telephone No. 1, while extension telephone No. 2 is communicating with the outside, and,
5. To call up and answer calls over extension telephone No. 1 and extension No. 2, while the chief telephone is communicating with the outside.

The operation of the commutator shall be by means of a guide key semigratory, with all its connecting pole terminals mounted on an appropriate base and covered with a protecting box leaving nothing but the key visible and the opening of the box necessary for its movement.

The box shall have indicators to show, according to the position of the key, what apparatus is in operation.

No. S. T. F. 53.—*Cordon of two conductor wires for telephone*

The cordon shall carry two thoroughly insulated conductors, with external coating of braided cotton or other approved material of dark grayish color. One of the wires must carry a thread of a distinct color. The cordon must be impermeable to humidity. The material of which it is made must be in accordance with the best practice in the matter. The cordon shall be shipped in rolls of 100 meters or 110 yards.

No. S. T. F. 52.—*Cordons of two wires, conductors, for telephone receivers*

Each cordon shall carry two conductors thoroughly insulated between themselves and the outside, with an external lining of braided cotton or other approved material of a dark grayish color.

One of the wires must bear a thread of distinctive color.

The four ends of the cordon conductors shall have terminals in the form of an eye, of tinned bronze. The covering of each wire must be finished in due form. The external protecting lining covering the insulated conductors, must be finished in such form that it may serve to bear the weight of the apparatus.

The cordon shall be impermeable to humidity. It shall be 75 centimeters long, in accordance with the accepted practice in the matter.

No. S. T. F. 56.—*Cordons of two conductor wires for telephone switchboards*

The conductors shall be of flexible metal and low resistance. Each wire shall be of a distinctive color. The external braided lining, of dark grayish color, shall be double and the conducting wires lined and packed in such manner that, with its external lining, the cordon will be of round form.

The braided external lining must be impermeable to humidity.

The four projecting ends of the conductors shall appear in eye form terminals, of tinned bronze. The cordon must be thoroughly flexible and made of materials of good quality for use on switchboards carrying large traffic.

At one end, the lining shall be in the form of an eye terminal, able to bear the counter weight and the cord, according to practice.

The cordon shall be 6 feet or 2 meters long.

No. S. T. F. 54.—*Cordon of four conducting cords for telephones*

The cordon shall carry four conductors thoroughly insulated one against the other and the outside, with external lining of braided cotton or other approved material of dark grayish color. One of the wires shall carry a lining or thread of distinctive color. The cordon must be impermeable to humidity. The material of which the cordon is made must be in accord with the best practice in the matter.

The cordon shall be shipped in rolls of 100 meters or the equivalent.

No. S. T. F. 55.—*Cord of six conductor wires for telephones*

The cord shall carry six conductors thoroughly insulated between themselves and the outside. The external lining shall be of braided cotton or other approved material of dark grayish color. Each of the wires shall have a thread of distinctive color. The cord must be impermeable to humidity, and the material of which made must be in accordance with the best practice in the matter.

It must be forwarded in rolls of 100 meters or the equivalent.

No. S. T. F. 2018.—*Muffled (damped) bells*

They shall be covered with a wood case carrying well finished terminals.

The resistance of the damping bobbins must be 25 ohms. The bobbins must be of wire with enameled insulation.

No. S. T. F. 1087.—*Switchboard of new points*

The switchboard shall be of the swivel arm type on a horizontal plane in two positions with two terminals.

The terminals, the switchboard arm, and the contacts must be set on a base of finished teakwood of circular form.

All terminals shall have bronze nuts.

No. S. T. F. 2515.—*Resistance boxes for testing batteries*

Resistance boxes to test batteries with key and six resistances of 2, 2, 6, 10, 20, and 4,960 w., respectively, in portable and compact form.

No. S. T. F. 2500.—*Detectors for inspectors*

They must have bobbins of an aggregate resistance intensity of 100 ohms, and bobbins of 0.2 ohm quality with derivation of 0.2.

The needles must be of the induced Varley type. The instrument shall have three terminals and a metal socket to carry it. The whole shall be inclosed in an approved leather bag, provided with a strap to carry it by hand.

No. S. 188.—*Three color portable lamps*

They shall be paraffin or oil lamps with portable cup sufficient to keep them lighted for at least 12 hours.

The case shall be of approved metal, with a wide opening to remove the cup. It shall have a reflector and a rotary device to change the natural color to red or green, and the colors of the chimneys shall be according to the specifications for signalization as prescribed by the United States Signal Association.

No. S. F. 2501.—*Galvanometers*

These shall be used for comparison in cases of earth currents and contacts with telegraphic circuits.

They shall have a minimum resistance of 20 ohms.

The normal position of the needle shall be vertical and indicate on the right or left side within a dial of 90°, which shall be one-half of a sphere of minimum diameter of 10 centimeters with clearly printed scale.

The instrument shall bear proper pins or a switchboard of four dials for the different positions in the verifications.

No. S. T. F. 1082.—*Galvanometers for telegraphic use*

They are of simple current, of the 2-bobbin type with induced needle, and the scale divided in a sphere of plated bronze and inclosed in a case of Gothic style, of teakwood or mahogany.

The bobbins shall be wound with 30 w. enameled wire and terminate in well finished bronze. The standard test of this galvanometer shall be 9.3 milliamperes.

No. S. T. F. 51.—*Switchboard hanger for telephone apparatus*

The hanger shall be of the split kind and of nonoxidizable metal, blued by preference.

The spring, of German silver or other approved metal, fitted to the hanger, shall be of the friction contact type. The contact points must be of platinum or other approved metal.

Insulation of the spring must be proof against 1,000 volts of alternating current and must be of nonhygroscopic or absorbent metal.

The hangers (hooks) must be easy to install or remove, even as the springs, so as to be easily replaced when worn and torn.

The size of the split hook shall be such as to permit of the installation of the different types of receivers.

No. S. T. F. 529 AND S. T. F. 1529.—*Adhesive insulating tape, one-half inch wide*

The tape shall be of strong material, uniformly impregnated in an insulating composition, and must not be porous.

The tape shall be put up in rolls of one-half pound, and must be forwarded well packed so as to preserve its insulating power.

White tape No. 529 and black tape No. 1529.

No. S. T. F. 530.—*Pure rubber tape, one-half inch wide*

This rubber tape must be according to the specifications of the American Railway Signal Association. The tape shall be put up in rolls weighing one-half pound, properly protected in cases impermeable to the air to prevent its deterioration.

No. S. T. F. 1016.—*Carbon plates*

They will be used for boxes of Leclanche batteries. They must be of retort carbon and the bronze terminal soldered to the plate by means of a lead cap, which shall cover the plate for at least 15 millimeters. The lead cap shall be treated with protecting paint. The upper part that extends below the lead cap must not be porous. The nut of the terminal shall be thoroughly adjusted to the pin of the same. The width indicated in the list must be measured from the upper part of the lead cap to the lower part of the plate.

No. S. T. F. 15.—*Microphones for wall instruments*

They shall be of the "solid back" type. The diaphragm of thin, smooth iron or thin aluminum, must be tinned, and in case of aluminum, finished merely on the inside and enameled on the outside so as to make the diaphragm withstand

the instantaneous action of 200 volts; it must be 0.2 to 0.5 millimeter thick and its diameter vary according to the type of microphone between 5 and 7.5 centimeters.

The microphone shall be incased in nonoxidizable metal, and, preferably, treated with an enamel paint.

The earpiece shall be of enameled bronze screwed to the case. The microphone shall be carried on a movable arm of metal connected with the microphone and installed in the case of the apparatus by means of pins and nuts; the arm shall be hollow so that it may carry two insulated conductors, from the terminals in the wooden case to the case of the microphone. All parts of which composed shall be according to the best usages in the matter.

No. S. T. F. 21.—*Microtelephone for telephone, ordinary type*

It shall be composed of a circular receiver (No. S. T. F. 22), bipolar with the continuous magnet between the electromagnets, with terminal connection and without oxidizable metal parts visible to the eye. The ohmic resistance of the two bobbins in series shall lie between 50 and 80 ohms, at a temperature of 15.5° C., and the wire used in the winding of the bobbins shall preferably be of enameled copper and impermeable to humidity. The diaphragm of light, soft iron must be tinned within and enameled without; its thickness shall be between 0.2 and 0.5 millimeter and its diameter vary according to the receiver type, between 5 and 6.5 centimeters.

In addition, a microphone (No. S. T. F. 23) of the "solid back" type, with a diaphragm of light, soft iron or thin aluminum, tinned in the case of iron and finished in the case of aluminum on the inside and painted with enamel on the outside; its thickness shall be between 0.2 and 0.5 millimeter. Its diameter shall vary according to the microphone type, between 5 and 7.5 centimeters.

The microphone shall be installed in a metal box, nonoxidizable, and preferably treated with an enamel paint. The earpiece shall be of enameled bronze, screwed to the case. All parts of which the microphone is constructed shall conform to the best usage in the matter.

The handle carrying the receiver and the microphone shall be of vulcanized rubber or nonabsorbing metal with its respective commutator spring.

The end of the receiver shall have a ring of an internal diameter not less than 1 centimeter, made of nonoxidizable metal, so that it may be hung to the respective handle.

No. S. T. F. 80.—*Chest microphones for telephone switchboards*

They shall be of the "solid back" type with a diaphragm of iron or aluminum installed within an aluminum case. The earpiece shall be of enameled bronze, screwed to the casing. The parts of which the microphone is constructed must be according to the best practice in this matter; the casing itself must be mounted on an aluminum base of proper form, with insulation of leather or other approved material. The upper ends of the board shall be provided with rivets to carry the band of braided cotton, gray color, to suspend the apparatus over the chest of the apparatus. The microphone shall bear a cord of four wires of appropriate width ending in two plugs to couple with the switchboard jacks.

No. S. T. F. 29.—*Telephone magnetos*

Their size shall not exceed 14 by 12 by 8 centimeters, without the handle. It shall be constructed in such manner that it will operate a bell of 2,400 ohms through a resistance of 10,000 ohms. In addition, it shall ring 20 bells of 1,000 ohms each in series, there being installed between the magneto and the first bell a resistance of 1,000 ohms.

The magneto shall be of the open circuit type.

The device with which to operate the magneto must be of nonoxidizable material, except the coupler, which must be of approved material, incombustible, and nonabsorbent. All handles for the magnetos must be of the exchangeable kind; the winding of the armature shall preferably be of enameled wire and impermeable to humidity.

No. S. T. F. 1085.—*Telegraphic keys for simple current*

The lever of the key must be of bronze throughout, of solid construction, and fitted with a spiral tension spring; it must have platinum contacts. Every wire connection shall end in a bronze terminal of not less than three-sixteenths inch diameter.

Every key with insulating socket between the parts that carry currents of different potentials will be rejected.

For insulating keys the entire lever, the operating stand, and connection poles must be covered with a black color insulating material, durable and unbreakable, so that it will withstand a voltage of 3,000 volts for a minute.

No. S. T. F. 1084.—*Key for simple current with commutator*

There remain in force at present the general specifications of S. T. F. 1085, approving a commutator lever for "call and answer" so as to make it usable for double current with divided battery, which shall be mounted on a base of ebonite, installed on a clean base cloth and carrying the four corresponding terminals.

No. S. T. F. 1083.—*Senders (keys) for double current*

They shall be of the closed type in which the contacts are held in a cylindrical case with glass top. The contact key shall be of the divided lever type, with four contacts operated by four springs, with platinum points.

The internal connections shall be properly connected with five poles.

The key must be provided with a switch (calling and receiving) and the whole of the metal parts should be approvedly mounted on an ebonite board resting on a teakwood base.

All the material used in the construction must be of the best quality and workmanship.

No. S. T. F. 2517.—*Milliammeter*

A milliammeter to read up to 15 milliamperes in the total radius of the scale of not less than 6 inches. Shunts to read up to 30, 75, 150, 1,500, 3,000, 7,500, and 15,000 milliamperes and corresponding scales. The internal resistances as low as possible must be specified.

No. S. T. F. 501.—*Straight joint pins (bolts) for telephone line insulators*

The bolts must be of galvanized steel, five-eighths inch in diameter; the top shall have wooden thread, six threads per inch, finished so that they may be screwed to the insulator. The lower end must be taped with Whitworth thread over a length of not less than 55 millimeters.

Each bolt must carry a hexagonal nut and have a rim.

The Whitworth thread of the bolts must be treated with an anticorrosive solution.

Each quotation must specify the minimum rupture weight of the bolt offered.

The bolts must be forwarded in bunches of 50.

For sizes, see plan 501.

No. S. T. F. 502.—*Curved bolts for telephone line insulators*

The bolts must be of the curved type, of galvanized steel, fit to bear No. 8 wire lines of iron.

One end of the hook must be provided with wood thread of six threads per inch. The other end must be five-eighths inch in diameter fit to enter into the uniform recess of a wooden cross-arm. It shall be provided with Whitworth thread and according to plan S. T. L. 502. We do not specify the diameter of the hook in its curved part; but the hook must be of sufficient resistance to carry without deformation a load of 170 kilograms with safety.

Each bolt must have a hexagonal nut and a round rim.

The Whitworth thread of the bolts must be treated in an anticorrosive solution. The bolts must be shipped in parcels of 50.

No. S. T. F. 1511.—*Straight bolt for cap borne in upper part of the pole*

The bolts must be of cast steel, malleable fusion, soft seel, or malleable iron, thoroughly galvanized, and the sizes shall conform to the plan No. S. T. L. 1511. The entire bolt thread must be threaded with an anticorrosive solution. The bolts shall be forwarded in bags of 50 each.

No. S. T. L. 503.—*Bolts with hexagonal nut and collars for use with wooden cross heads in wood poles*

Plan No. S. F. L. 503.

They shall be of steel, $8\frac{1}{2}$ inches long and $\frac{1}{2}$ inch in diameter, galvanized, according to the specifications of the company.

The length of the bolt is understood as between the top and the embedded nut. One end of the bolt must be tapped with Whitworth thread over a length of at least $1\frac{1}{2}$ inches, while the other end shall have a cap of approved hexagonal or square form. Each bolt shall have two square collars and a proper hexagonal nut. The bolts shall be shipped after threads have been treated with an anti-corrosive composition.

A sample of the bolt must accompany the bid.

The material must be submitted in accordance with the general specifications of the company.

No. S. T. F. 504.—*Bolts with hexagonal nut and collar for use with saddle in wood crossheads*

Plan No. S. F. L. 504.

They shall be of steel, 4 inches long by $\frac{3}{8}$ inch in diameter, and galvanized in accordance with the company's specifications.

The length of the bolt is understood as between the head and the embedded nut.

One end of the bolt shall be tapped with a Whitworth thread over a length of $1\frac{1}{2}$ inches, while the other end shall have an approved hexagonal or square head form. Each bolt shall have two round collars and an appropriate hexagonal nut.

The bolts shall be shipped after having been treated with an anticorrosive composition.

A sample of the bolt must accompany the bid.

No. S. T. F. 40.—*Dry batteries*

The bidders must state the capacity in ampere hours with given discharges, showing diagrams of tests of the batteries offered along with a sample that must accompany the bid.

The company will refuse any battery that may have been manufactured more than four months before the date of delivery; therefore, each battery must bear date of manufacture, along with a number or distinct letter.

The company shall indicate the dates of delivery, which shall be at equal intervals during the year.

One-half per cent of every delivery shall be tested in the same manner as indicated in the diagrams submitted by the bidders, and if any battery shows more than 10 per cent below the test stated by the bidders, the company shall refuse such part.

No. S. T. F. 1097.—*Lightning arresters of the carbon type*

They shall be in such form as will permit them to operate with the guaranties S. T. 1076. They shall be provided with coating or not. The coating shall be of an insulating and incombustible material. The carbons must be adjustable. The arrester is to protect a metallic circuit in a single body; the clay bar shall form the central element.

No. S. T. F. 1086.—*Acoustic screen*

It shall be of the twin-table type, provided with screws to affix the vibrator; the pedestal shall be of varnished bronze. The case shall be of mahogany or finished teakwood. The size shall be approximately 273 by 178 by 438 millimeters.

No. S. T. F. 2511.—*Wheatstone bridge*

Wheatstone bridge with a ratio of arms of 10–10,000, of the contact-plug type; complete with galvanometer (Paul) of the "unipivot" type, in two cases of mahogany. The galvanometer shall come in a leather case with strap; maximum current of the bobbins must be stated and normal temperature established.

No. S. T. F. 1.—*Hand telephone receivers for current circuits*

They shall be of the bipolar type, with continuous magnet, between two electromagnets, with terminal connection concealed and without any metallic parts visible. They shall carry a ring of not less than 1 centimeter of internal diameter, so that at the end it may be affixed to the hook of the case.

The mouthpiece and the earpiece must be of vulcanized rubber or of a vulcanized rubber composition, of high ohmic resistance, very durable, and not breakable. The ohmic resistance of the wire of the two bobbins of the receivers in series must not exceed 80 ohms nor be less than 50 ohms at a temperature of 15.5° C. for telephone connected with current circuits. The wire used in the winding of the bobbins must be preferably of enameled rubber and impermeable to humidity. The diaphragms of soft, smooth iron must be internally tinned and enameled on the outside, and must be between 0.2 and 0.5 millimeter thick; their diameter may vary according to the type of receiver between 5 and 6.5 centimeters.

No. S. T. F. 9.—*Telephone receivers, of the circular type, for current circuits*

They must be bipolar, with continuous magnet between the electromagnets, with concealed connection terminals and without oxidizable metallic parts in evidence. Each receiver shall be provided with a ring of an interior diameter not less than 1 centimeter to fasten it on the hook.

The ohmic resistance of the bobbins, in series, of the receiver employed in current circuits shall be between 50 and 80 ohms at a temperature of 15.5° C.

The wire used in the winding of the bobbins shall preferably be of enameled copper impermeable to humidity. The diaphragm of soft iron shall be tinned within and enameled without; they shall be between 0.2 and 0.5 millimeter thick, and their diameters vary, according to the type of receiver, between 5 and 6.5 centimeters.

The ring by which to hang up the receiver must be made so as to permit of the placing of a steel band covered with leather to be used as a head telephone in telephone switches.

No. S. T. F. 79.—*Head telephone for telephone switchboards*

They shall be as per specifications No. S. T. F. 9 with appropriate band and cord.

No. S. T. F. 1080.—*Nonpolarized relay*

The relay shall be equipped with adjusting screws and the whole of the apparatus be inclosed in a varnished bronze case with beveled glass top. It shall be mounted in a terminal box of finished teakwood.

The relay shall be wound differentially 100+100=200 ohms, with divided armature and central insulation. The bobbins must be wound with enameled wire. The winding and local connections shall end in appropriate terminals on the base of teakwood and appropriately marked.

No. S. T. F. 1188.—*Wheel with pedestal*

It shall serve as a recording band, of bronze with tapped iron pedestal.

Its general dimensions shall be approximately 219 by 76 by 235 millimeters.

The wheel will be so constructed as to permit of winding and unwinding the band.

No. S. T. F. 1071.—*Ammonium salt (ammonium chloride)*

It shall be of the commercial type, crystallized; the powder it may contain must not exceed 10 per cent the total weight of the salt. It shall be shipped in barrels.

No. S. T. F. 1076.—*Safety fuzes*

The fuzes shall be of the kind that will protect the telegraph and telephone lines from the effect of contact with a line of 3,000 volts. The fuze (guard) shall not be less than 10 inches long and the fusible wire shall be inclosed in the form of a fuze not producing an arc. The divisions to carry this guard shall be of the longitudinal compression type and be fitted with proper terminal screws. The complete guard shall be mounted on a porcelain base or any other material of high insulation and incombustible.

The manufacturers must finish their standard guard types to protect against currents of 3,000 volts as an alternative, and the bid must be accompanied by a sample.

No. S. T. F. 1079.—*Recording system of bells for local circuits*

The ink table shall be of the rotary type submerged in an ink receptacle. The armature extension with the inking apparatus shall be carried through the clockwork box.

The bobbins shall be wound at 30 w. per bobbin and enameled wire shall be used.

The couplings of the bobbin must be of bronze and all metallic parts of solid construction.

Adjustments must be provided for current fluctuations. All the insulating metal must bear 10,000 volts per minute.

No. S. T. F. 1077.—*Polarized recording system of bells*

The instrument shall represent a combination of polarized and sounding recorder. The cores shall be wound at 500+500 w. and operate normally with 10 milliamperes. For operation of double current and with 15 milliamperes for simple current operation. The signal of the alarm shall be strong and clear when operated with the recorder.

The marking system shall be of the revolving-disk type, passing through an ink cup. The winding shall be of enameled wire and the respective couplings of bronze.

All connections shall be of bronze terminals of not less than three-sixteenth inch in diameter.

The instrument is for use in direct work.

The wheels of the device and the brakes shall be of the best quality material and thoroughly finished.

In general, the construction must be of material of the best class. The resistance between any internal wire and its support shall be sufficient to resist up to 3,000 volts.

No. S. T. F. 1087.—*Relay alarm*

The relay shall be of the vertical type, operating on an even plane.

The resistance of the bobbin shall be 250 w. c. u. and be of enameled wire.

The signal of the alarm must be strong and clear. The material used for the coupling of the bobbin, stand, and support shall be of solid bronze.

All wire must be finished in bronze terminals of not less than three-sixteenth inch in diameter. The instrument is for use in direct work. The adjustment shall be verified in the supports of the axles and within the contact space. The workmanship must in general be of the highest grade and the varnishing done in perfect manner.

No. S. T. F. 2813.—*Shunts*

These shall be for volt milliammeter according to sample, adaptable to readings from 0 to 1 ampere and from 0 to 10 amperes. It is the volt milliammeter type of the British post office, called detector No. 2.

No. S. T. F. 2514.—*Universal shunt*

Universal shunt with multiplying power of 1, 3, 10, 30, 100, 300, and 1,000. It shall be of the radial contact arm type and its total resistance 1,000 w. The maximum current of the bobbins must be stated without risk of rupture.

No. S. T. F. 77.—*Wall telephones*

These telephones shall be constructed in boxes of polished wood, preferably of teak wood, with all assembled unions.

Upon opening the doors to the box access must be readily had to all inside parts.

The box shall be of smooth surface, so as to lend itself for use as a writing desk to make notes and hold all accessories and telephone batteries, excluding the microphone; receiver, hook, gongs, and crank must be given necessary space.

The upper space of the box must be large enough to hold, in addition to a magnet No. S. T. F. 29, a bell No. S. T. F. 41, commutator No. S. T. F. 51, induction bobbin No. S. T. F. 26, and the connection wires. The lower space must be sufficient for a battery of three cells.

Both divisions must be absolutely separated one from the other to prevent gases issuing from the batteries to penetrate into the upper compartment.

Those parts not contained in the box must be covered with a substance that will prevent their oxidation, and all openings permitting access to the shaft, etc., must be as small as possible and protected against contact with metallic plates.

The connections must be installed within the box, but in such position that they may be inspected at any time, and therefore may not be covered with substances that may interfere with such inspection.

Contacts shall be of the friction and not of the shock type. The wires and insulations must be proof against an instantaneous alternate current of 500 volts.

The telephone must be equipped with a magneto No. S. T. F. 29, bell of alternate current No. S. T. F. 41, induction bobbin No. S. T. F. 27, receiver No. S. T. F. 1, microphone with arm No. S. T. F. 51, and the hook switch No. S. T. F. 51.

No. S. T. F. 107.—*Table telephones*

The table telephone must be equipped with a magneto, which must conform to the specification of No. S. T. F. 29; the polarized bell must have a resistance of 1,000 ohms. The bobbin must conform to No. S. T. F. 27, and the combined microtelephone must be according to the corresponding specifications; especially with regard to the switch in the handle.

All the telephone contacts must be of the friction type and not of the shock type. Insulation of wires used in the telephone must be such that they may withstand an instantaneous alternate current of 500 volts.

No. S. T. F. 168.—*Telephones proof against rough weather*

The external box must be of nonoxidizable metal and constructed in such manner that the telephone apparatus will be absolutely protected against rough weather, and each must carry the necessary accessories to affix a padlock. The telephone apparatus is to consist of:

1 magneto No. S. T. F. 29.

A bell No. S. T. F. 41.

A microphone, No. S. T. F. 15, directly mounted in the external box instead of on an arm, receiver No. S. T. F. 1, with cord.

Hook switch No. S. T. F. 51.

Induction bobbin No. S. T. F. 27.

The winding of each bobbin must by preference be of copper with enamel insulation and protected in such way that it will be proof against humidity. All the wiring between the accessories of the box, including the cord of the receiver, must be treated to make them proof against humidity.

The box shall have sufficient room to carry a pair of fuzes and a set of lightning arresters of the standard type in addition to its batteries. The entrance for the exterior wires must be made in such form that it will prevent entry of humidity.

The openings of the installation of the apparatus shall be outside and of appropriate form. A sample of the apparatus, or a diagram with all dimensions indicated, must accompany the bid.

No. S. T. F. 73.—*Wall telephone stand for 10 metallic circuits*

The frame top shall be of soft Swedish iron; the contacts and springs must be of material in accordance with the best practice. The signal boards must be installed in such form that when the number falls it may remain visible and the contact spring in the circuit of the night alarm must be inclosed.

The bobbin.—For the indicating signal of the line there shall be a winding of 1,000 ohms resistance of copper wire with insulation, preferably enameled and impermeable to humidity. The core shall be of soft Swedish iron. The bobbin must be removable from the frame and protected against induced currents by means of a soft wire tube.

Jacks.—They must be of hardened metal and one-fourth inch in diameter of the ring to conform to the case. The springs must be made of appropriate metal according to the best practice.

Keys.—They shall be of hardened metal with a protecting covering of insulating metal, nonabsorbent, and strong enough to carry a cord of two appropriate conductors; its size shall be one-fourth inch in diameter to correspond to the jacks.

No. S. T. F. 2502.—*Strain pins*

The strain pins are of the pinion type with automatic escapement and shall by preference be provided with dynamometers. The drum must permit of receiving at least $1\frac{1}{2}$ meters of wire of 800 pounds per mile.

No. S. T. F. 2016.—*Electric alarm for inside installation*

It must be provided with a bell of nicked metal from 7 to 8 centimeters in diameter. The resistance of the enameled wire used in the bobbins must show 25 ohms. The bobbins must be duly protected within a box of polished wood.

No. S. T. F. 2017.—*Electric bell for outside installation*

It shall have a bell of galvanized metal 20 to 30 centimeters in diameter. The resistance of the enameled wire used in the bobbins shall measure 25 ohms, and the bobbins must be properly protected against rough weather within a metal box.

The box shall give free access for the wire against inclement weather conditions.

No. S. T. F. 1095.—*Stands for mounting telegraphic apparatus*

The stand must be of thoroughly dried and select wood and shall have four supporting angles and in all respects conform to the dimensions indicated in plan S. T. F. 1095.

No. S. T. F. 1020.—*Glass jars for Leclanche batteries*

They must be free of faults, bubbles, or any other defects and the upper part must be covered with a protecting paint not less than 25 millimeters from the opening of the jars.

They shall have the appropriate divisions along the border for the affixing of zinc.

No. S. T. F. 2516.—*Voltmeter*

A voltmeter with an internal resistance of 2,500 ohms per volt, scale of 0/4 volt multiplying coils for 40 and 400 volts. Radial graduate readings not less than 6 inches. Complete with case.

No. S. T. F. 2512.—*Volt in ampere meters*

They shall be provided with scales from 0 to 5 volts, and of 0.50 volt the resistance shall be 100 ohms per volt. Scales for amperes of 50 milliamperes; 500 milliamperes, 1 ampere, and 10 amperes, with their shunts included in the instrument.

The instrument shall be forwarded in its heavy leather case with strap for carrying.

SPECIFICATIONS AND BASES FOR THE ACQUISITION OF TIES

1. *General remarks.*—These specifications refer to the purchase of ties for a narrow and wide gage track for the use of the company, in the quantities to be indicated, according to the needs of the service.

2. *Dimensions.*—Ties of the following sizes will be purchased:

0.15 by 0.25 by 2.75 meters (6 by 10 inches by 9 feet).

0.15 by 0.20 by 1.80 meters (6 by 8 inches by 6 feet).

3. *Time of cut.*—The ties must be cut from sound trees in the months from April to September.

4. *Lumber permitted.*—The ties must be of pellin oak, cypress, or larch wood. Ties shall also be purchased of fibrous (apellinado?) coigue wood and resinous eucalyptus in the proportions indicated by the company.

5. *Preparation.*—The ties shall be cut either by the use of a hatchet or sawed. Their axis must be in a direction parallel to the fiber. Their sides must be flat, edges straight, and section uniform and rectangular.

6. *Tolerances.*—(a) There shall be a variation allowed in the width or height of the tie of 0.008 meter less and 0.012 meter more. In the length, there shall also be allowed 0.025 meter less and 0.050 meter more.

(b) In the case of 1.80-meter ties, there shall be accepted surface cracks at the extremities up to 0.150 meter and 0.200 meter in the space between the rails. The same cracks shall be permitted in 2.75-meter ties up to a length of 0.305 meter in any of the two spaces. Other defects are tolerated in these spaces.

(c) Openings shall be tolerated if they extend along the length of the tie, provided they do not penetrate more than 0.015 meter.

(d) Curves with bends that do not measure more than 0.025 meter shall be tolerated.

(e) Wanes shall be tolerated up to a thickness of 0.050 meter provided they are at the edges or the ends. These wanes must appear only on one side and take up 0.005 meter on one side and 0.003 meter on the other, or 0.025 meter per side and up to 0.080 meter from where they are found there must be no other flaws.

(f) Hard knots shall not be considered defects, unless they are in the rail space where they will not be tolerated.

(g) Surface worm holes are tolerated, provided they are not in the rail space and on no more than two sides of the tie.

(h) No ties shall be accepted if infested with moths and other insects. Ties with worm holes of considerable depth shall also be refused. In general, ties which, in the opinion of the inspector, contain flaws capable of decreasing the resistance thereof shall not be accepted.

(i) Dead portions shall be allowed in ties only when they do not remove more than 0.025 meter per edge and per side and if the tie has no other defects.

(j) There shall be permitted a variation in the measurement of the tie of 6.3 millimeters ($\frac{1}{4}$ inch) less in the width and height and 12.7 millimeters ($\frac{1}{2}$ inch) more, and 25.4 millimeters (1 inch) less in the length, and 50.8 millimeters (2 inch) more.

(k) Ties not furnished according to these specifications shall be refused.

7. *Places of delivery.*—The ties must be delivered to the sheds, reserved for that purpose by the company, at any station on the line.

8. *Minimum quantities accepted.*—Bidders may submit tenders for the number of ties they desire to furnish, but shipments must never be smaller than the following:

30,000 ties, gage of track 1.68 meters.

20,000 ties, gage of track 1.00 meters.

5,000 ties, gage of track 1.43 meters.

9. *Delivery sections.*—The sections where the ties are delivered may not comprise more than four contiguous stations. The bidder must specify the number of units to be delivered on each section.

10. *Comparing tenders.*—In order to compare the tenders, it shall be considered that for the Red Sur (southern system), the ties offered north of Temuco are for use in Zones I, II, and III, and those offered to the south, for Zone IV. For the Red Norte (northern system), it shall be considered that the lumber must be concentrated at Valdivia for its shipment north. Consequently in comparing there shall be considered the unit price, the point of delivery, and the quality of the ties offered.

11. *Periods for delivery.*—(a) The period for the total delivery of the ties contracted for shall be fixed when the bids are invited.

(b) Deliveries must be begun on the date fixed in the bases and according to the quotas fixed by the company.

12. *Previous inspection.*—No shipment shall be considered as received until after its inspection by the company's representative, who shall be authorized to verify the grade, shape, and dimensions of each tie delivered and to reject those he deems unsatisfactory. The ties classified by the inspector shall be marked by him, both the ties received and those refused. For this purpose, the contractor must request the classification of the ties by the warehouse official on the form furnished by the company therefor, so that the proper instructions can be issued to the inspectors.

13. *Delivery receipts and classification certificates.*—The representative of the company must mark each piece which he believes conforms with the conditions of the contract and shall issue a delivery receipt for each shipment delivered at the stations.

14. *Guaranties.*—All tenders must be made on the forms provided by the company, bearing the stamps required by law and accompanied by a guaranty deposit slip showing that a deposit was made at a bank satisfactory to the company, or with the cashier of the company, to the order of the director general of

the Ferrocarriles del Estado, for a sum equivalent to 2 per cent of the total amount of the tender. The deposit slips must not state the reason for the deposit.

15. *Book of general conditions and specifications for the purchase of material to be used on the State Railways.*—Tenders not conforming strictly to the stipulations in these specifications and to the general conditions of the said book shall not be considered.

16. *Place of origin of the material.*—All bidders must state in their tenders the place of origin of the ties.

17. *Quotations.*—Quotations must be made in legal money per unit, delivered to the sheds of the company at the stations.

18. *Opening of the tenders.*—The tenders must be presented to and opened at the office of the chief of the Departamento de Materiales y Almacenes at Santiago and the offices of the superintendents of Zones III and IV at Concepcion and Valdivia. They shall be opened simultaneously at those places on the hour and date set.

THE CONTRACT

19. To guarantee the faithful performance of the contract, the successful bidder or bidders must raise the guaranty referred to in article 14 to a sum equivalent to 10 per cent of the contract. It is understood that the liability of the contractor or contractors is not in any case limited only to the amount of the guaranty, as this liability does not affect any responsibilities generally incurred by law for all damages caused the company for not fulfilling or only partly fulfilling the terms of the contract.

20. *Fines for delays.*—If a contractor fails to deliver the proper number of ties within the stipulated period, the dirección general may, after the date set for delivery, purchase for its account the number of ties which were not furnished as agreed. The contractor must pay for all differences, if the price is in excess of the contract price, or he must pay a fine equivalent to 10 per cent of the value of the ties delivered after the stipulated period. The purchases referred to in this article may be made by the company at any time without the need of a previous notice of any kind.

21. *Fines because of inferior grades.*—If on account of the rejection of ties of a poor quality the company is compelled to use a greater number than that contracted for in each section, a fine of 5 per cent of the cost of each tie required in excess of the number contracted for shall be applied. The rejected ties must be removed from the storage sheds within six days. After that period storage charges shall be collected in conformity with the general conditions for public proposals.

22. *Collection of fines.*—The differences in price, the fines, and other sums to be paid by the contractor may be deducted from the amounts due him by the company, from his guaranty deposit or other sums. The liquidations for that purpose by the dirección general, with the approval of the Consejo de Administración, shall consist of securities sufficient to cover the amounts owed by the contractor in the cases contemplated in articles 10, 16, and 17.

23. *Cancellation of contract.*—The company reserves the right to cancel the contract at any time by merely issuing its resolution to that effect and may confiscate the amount of the guaranty deposit and collect all damages because of the nonfulfillment or part fulfillment of the contract.

24. *Payment of the guaranties.*—If for any reasons the entire amount of the guaranty is not deposited, the contractors are bound to pay the full amount within 10 days following the official notice sent by the dirección general. After that period, the company may cancel the contract by its official resolution, collect any damages incurred, or obligate the contractor to deposit the balance of the guaranty. For this action, the decree of acceptance and the liquidation by the dirección general, with the approval of the consejo, shall be considered as sufficient authority to determine the balance of the guaranty which the contractor must deposit.

25. *Payments.*—Invoices must be submitted in triplicate on the form provided by the company. They must be accompanied with the delivery receipt or the classification certificate, as the case may be. The contractor must promptly deliver his invoices to the warehouse official, after which they shall be handled as usual by the company prior to their payment. Payment shall be made by the Caja Central (Mapocho station) unless the contractor specifies the Caja Seccional.

26. *Domicile of contractors.*—For all the effects of the contract and the notifications, both judicial and administrative, which it may be necessary to serve the

contractor or contractors, the latter must establish their domicile in Santiago, Their bids must indicate their street address in full.

GENERAL PROVISIONS

27. *Increasing the quantity contracted for.*—The State Railways reserve the right to increase by as much as 10 per cent, under the same contractual conditions, the number of ties contracted for by merely notifying the contractor or contractors one month in advance, provided that this notice is sent during the first six months of the contract.

28. *Rejecting bids.*—The company may reject all bids or accept those it considers most advantageous, even if the quotations are not the lowest.

29. *Cases of force majeure or accidents.*—If a case of this nature occurs during the performance of the contract, the contractor or contractors must submit a written notice thereof to the dirección general of the State Railways (warehouse and material department) within 48 hours after the accident occurred or after they had knowledge of it. If this notice is not furnished, the company shall not, for the effects of the performance of the contract, consider that there is any case of force majeure or accident.

30. *Validity of prices.*—The company understands that the prices fixed by the bidders are good for one month, beginning on the date the bids were opened.

If the company accepts a bid the period of validity of which has expired and which the bidder is not in position to maintain, he must submit the proper written protest to the jefe of the Departamento de Materiales y Almacenes within a period of six days, beginning with the date on which the correspondence section made the proper record of the decree of acceptance. If this notice is not submitted, it shall be considered that the contractor accepts the award and is therefore subject to the obligation of making the delivery under the conditions stipulated in the respective contract and must pay all fines levied in cases of delays.

SPECIFICATIONS FOR STEEL TIE-PLATES FOR RAILS

1. *Material.*—The steel must be made by the Bessemer acid or open-hearth (Siemens-Martin) process.

2. *Traction tests.*—As regards tension properties, tie-plates must satisfy the following requirements:

Resistance to traction: 38.67 to 49.22 kilograms per square millimeter (55,000 to 70,000 pounds per inch).

Limit of elasticity: Not less than 50 per cent of the resistance to breaking.

Minimum elongation: 25 per cent in 50.8 millimeters (2 inches).

3. *Bending test.*—The test piece must be bent cold through 180° on itself without cracking on the outside of the bent portion.

4. *Manufacture.*—The plates must be rolled smooth and conform to the models made according to plans approved by the company. The plates must be straight and without any inequalities on the surface on which the rail will be supported. The following tolerances will be allowed in the dimensions of tie-plates with parts projecting parallel to the direction of the rolled portion: 0.8 millimeter ($\frac{1}{32}$ inch) more or less in the thickness, and 3.175 millimeters ($\frac{1}{8}$ inch) more or less either in the length or width.

All variations in length must be produced in the inner extremity of the plate.

The distance from the shoulder piece to the end portion on the outer side of the plate must be uniform.

5. *Workmanship.*—The holes for the bolts must be accurately cut without any burrs and the plates must have no cracks or curves. The plates must be marked with the mark of the company. The workmanship in general must be efficient.

6. *Inspection.*—The inspector representing the company shall have free access to the factory during the life of the contract and should be accorded all facilities to enable him to assure himself of the faithful performance of these specifications.

The tests and inspections shall be performed at the place of manufacture before the plates are shipped and in such a manner as not to impede operations.

7. *Number of tests.*—From each 15 packages of tie-plates, two tie-plates shall be removed at random for each test. If one of the test pieces produces unsatisfactory results, a third test may be made and the shipment accepted if the test is satisfactory. If the third test is unsatisfactory, the shipment shall be rejected and no claim shall be considered.

8. *Packing.*—The weight of the packages of tie-plates must not exceed 50 kilograms each and must be properly marked.

SPECIFICATIONS FOR SIGNAL TORPEDOES

1. *General remarks.*—These specifications refer to the purchase of signal torpedoes by the gross and in quantities required for the service.

2. *Manufacture.*—The signal torpedoes must be manufactured in such manner that when exploding under normal conditions none of the ingredients used in their manufacture will injure persons standing nearby. Therefore no torpedoes with metallic shells shall be accepted.

Torpedoes shall also be rejected if the sand used in the explosive mixture contains ingredients which will not pass through a screen having four meshes per centimeter. To prevent the torpedoes from slipping off the rail when the track is in a slippery condition, they must be sanded in all their parts in such a way that the sand will not become loosened under ordinary transportation conditions and use.

The lead bands must be strong and must not break upon being used. Their length must not be less than 190 millimeters, width 6 millimeters, and thickness 0.8 millimeter.

The explosion must be powerful, and loud, and the composition of the mixture must be such that it will be preserved indefinitely without deteriorating and endangering the place where it is stored. The torpedoes must be able to stand a temperature of 180° C. without exploding or altering their mixture. They must not explode when falling from the platform of the locomotive to the rail or some other hard surface.

3. *Certificate of quality.*—To participate in the public bidding it will be necessary to obtain a certificate of quality, satisfactory to the sección pruebas del departamento de materiales.

4. *Samples.*—From each lot of 10 gross or its equivalent there shall be removed by the inspector, at random, three samples which shall be sent in a separate package to the sección pruebas del departamento de materiales, with a notation of their contents so that they will be handled carefully.

5. *Tests.*—Two of the samples of the torpedoes shall be soaked in cold water for half an hour and afterwards tested beneath a locomotive in the regular form.

The third sample shall be used to test the sand and other ingredients.

If any one of the two samples soaked in water does not explode in the proper manner, or if it is noted that the sand consists of very coarse grains, the lot of 10 gross from which these three samples were removed shall be refused.

6. *Claims.*—The samples of the material refused shall be kept for 15 days after notice has been sent of their rejection. After this time the manufacturers shall lose the right to enter claims.

7. *Charges.*—Transportation and drayage charges of the rejected material must be paid by the manufacturer.

NORMAL METHODS ADOPTED BY THE TESTING SECTION (CHEMICAL LABORATORY OF THE STATE RAILWAYS)

QUANTITATIVE ANALYSES

Copper.—For testing copper in bars, copper wire, alloys, copper salts, etc., there may be used the methods of precipitation with metallic aluminum or the volumetric method by titration with potassium cyanide.

Tin.—For testing tin in ingots and alloys there shall be used the Pearce low volumetric method by titration with potassium iodide. In the case of tin salts, the dry method may be used, by melting with potassium cyanide to obtain metallic tin.

Silica.—There shall be used the combination dry and wet method, melting with sodium peroxide and hydroxide to disintegrate foreign substances and separate them by acids in order to obtain insoluble silica at the state of silicic acid (SiO_2).

Iron.—The volumetric methods by titration shall be used with potassium permanganate, or by precipitating it from its solutions with ammonia to a sesquioxide state in order to deduce promptly the per cent of metallic iron.

Alumina.—This may be determined by precipitating it from its solutions to a sesquioxide or phosphate state, using a solution of sodium and ammonium phosphate to precipitate the alumina to the phosphate state and promptly deducing while at the sesquioxide state.

Lime.—This shall be determined by titration with permanganate of potassium or by precipitating it from its solutions by oxalate of ammonium to the oxalate of calcium state and by calcination to obtain promptly the calcium oxide (CaO).

Magnesia.—The state of the oxide of magnesia shall be determined by precipitating it from its solutions with a solution of double sodium and ammonium phosphate, as pyrophosphate, and promptly deducing the per cent of MgO.

Manganese.—The Volhard volumetric method shall be used by titration with permanganate of potassium.

Lead.—The Alexander volumetric method may be used by titration with molybdate of ammonium, or the lead may be determined by precipitating it from its solutions with sulphuric acid to the state of lead sulphate to deduce the per cent of metallic lead.

Zinc.—The volumetric method by titration with potassium ferrocyanide may be used or it may be precipitated from its solutions with carbonate of soda or it may be calcined to obtain zinc oxide.

Sulphur.—The state of the sulphur shall be determined by precipitating it from its solutions at the sulphate stage with barium chloride.

Chlorine.—The volumetric method by titration with silver nitrate shall be used.

Phosphate.—To be determined by precipitating it from its solutions to the state of phosphomolybdate of ammonium and as pyrophosphate of magnesia to deduce from these precipitations the per cent of phosphate.

Gold and silver.—The dry method shall be used by melting with litharge, bicarbonate of soda, and other fluids, according to the composition of the sample, lead obtained by melting will cupellate in bone-ash cupels until the lead is volatilized and gold or silver particles are obtained.

Barium.—The combined dry and wet method shall be used, by melting with carbonate of soda to obtain carbonate of barium and treating the latter with hydrochloric acid and precipitating the barium with sulphuric acid to the sulphate of barium state.

Appendix F.—REGULATIONS CONCERNING CONSTRUCTION OF WORKS ON STATE RAILWAYS

PART I.—CALLS FOR BIDS

GENERAL PROVISION

ARTICLE 1. Except in the cases contemplated by these regulations, construction of works on the State Railways shall be effected as a result of contracts awarded through a public bid and naming a total price.

ART. 2. These regulations, in so far as they are not contrary to the bases of the bid, shall form an integral part of all contracts for construction of works on State Railways.

ART. 3. The bases of the bid shall consist of:

- (a) A document containing the special technical specifications for the contract.
- (b) A special document stating administrative conditions of the same.
- (c) A specification of the quantities (of materials) required, and an itemized estimate of the cost of same.
- (d) An itemized list of materials the administration can furnish and the conditions of delivery of same.

ART. 4. Public bids shall be called for by the general director through notices published in the *Diario Oficial* and other local newspapers as long before the date of opening the bids as the law requires.

ART. 5. Only such persons or companies as are inscribed in the Register of State Railway Contractors may file bids in response to the call. This register shall be kept by the general administration.

ART. 6. Only the following may be inscribed in the register of contractors:

- (a) Engineers that have diplomas from reputable universities and that have had at least two years of professional experience, and who prove that they have worked at least one year on similar works;
- (b) Engineers who prove that they have supervised the construction or operation of railways for at least a year;
- (c) Contractors without diplomas who prove that they have superintended, directly and satisfactorily, the construction of railway works, and that they have had at least three years of experience in construction work of this kind;
- (d) Capitalists lawfully associated with engineers who fulfill the requisites specified in clauses (a) and (b) of this article;
- (e) Persons not holding an engineer's diploma and who have never been engaged in railway work may also be inscribed in the register of contractors as eligible to undertake any work not strictly that of railway construction, such, for instance, as the erection of buildings.

ART. 7. Inscription in the register of contractors shall be requested of the general director by means of an application on stamped paper, in accordance with the law, accompanied by the documents required.

If inscription is applied for by a society or company, the application shall be accompanied by the company's charter.

The application for inscription shall be made at least 15 days before the date of opening the bids.

ART. 8. The general director may order stricken from the register:

(a) Contractors who, without just cause, exceed the term fixed for execution of the works by more than 25 per cent;

(b) Contractors for those works in which, at the time of delivery or afterwards, are discovered frauds or defects in construction, arising either from the use of materials of poor quality, or from poor execution of the work;

(c) Contractors who give cause for the cancellation of the contract, without being compelled to do so by force majeure.

A contractor whose name has been stricken from the register may not have it inscribed therein again.

Every decision ordering a contractor's name to be stricken from the register shall be published in the Boletín del Servicio de los Ferrocarriles.

ART. 9. The register of contractors, in addition to the name, surname, and domicile of the contractor, shall contain:

(a) A copy of the documents of provisional and final acceptance of the works executed, with the remarks made by the acceptance committee.

(b) A copy of the documents stating how the orders issued have been complied with.

ART. 10. Bids must be filed on the blank forms delivered in each case for this purpose, and which are at the disposal of the interested parties in the office of the secretary of the general administration.

The interested parties shall be furnished, at their own expense, with a copy of the plans and data relative to the project.

It is the duty of the bidders to verify the exactness of the data concerning the project on the ground.

Any error noted in them can not be alleged by the successful bidder as a ground for nonfulfillment of any obligation imposed on him by the contract, for increase of the price, extension of the term fixed, or indemnifications of any kind; the basis of the bids must be the study made by the bidder himself; the cubic dimensions and quantities recommended as bases of the estimates by the official plan are merely illustrative data.

FILING BIDS

ART. 11. Bids shall name a lump sum as the price of construction of the works indicated in the plans and specifications of the final plan, and must be filed in a sealed envelope on the blank forms which will be given to the bidders. The only thing to be written on these forms by the bidder is the price, or prices, and he shall not be allowed to make changes of any sort therein.

ART. 12. Each bid must contain the name, surname, domicile, and signature of the bidder and must comply with the provisions of the law concerning stamped paper, seals, and stamps, No. 2219, of September 7, 1909, and 2288, of March 5, 1910,¹ and the accompanying documents shall come under separate cover.

OPENING, EXAMINING, AND AWARDING OF BIDS

ART. 13. The bids shall be opened in the presence of the general director or a duly authorized official, at the place and time set in the respective notices, and in the presence of the bidders. This official shall not consider bids not fulfilling the requirements stated in articles 11 and 12 of these regulations, nor shall they appear in the record.

¹ Art. 3, No. 59. Public bids filed in State or municipal offices, 5 pesos.

(a) Of a certificate of deposit in a bank having an office in Santiago, or in the treasury of this city, to the order of the general director, of a sum equal to 2 per cent of the official bid;

(b) Of an authenticated copy of the respective charters in case the bid is formulated by a construction company or concern.

If the bid should be more than 10 per cent less than the official estimate, it shall be accompanied by a second certificate for the amount of the difference between amount of the bid and 90 per cent of said estimate.

The bid, and the documents accompanying it, must be filed in the Spanish language and the sums shall be expressed in the kind of money indicated in the bases. The official authorized to open the bids shall first open the envelope containing the accompanying documents, and bids not meeting the requirements of this and the preceding articles shall not be considered, the envelopes containing the corresponding bids being returned unopened.

ART. 14. The record of the opening of the bids shall contain only the data necessary to distinguish them from each other, and no remarks or complaints by the bidders shall be added thereto. The latter may, however, demand that their rights be enforced, before the council of administration or the general director, as the case may be, by means of a petition.

The record shall be signed by the official who opened the bids, and also by the bidders.

ART. 15. The bids, after being duly examined and investigated, shall be sent to the council of administration or the general director, as the case may be, in accordance with the provisions of the law of reorganization of the State Railways.

ART. 16. The council, or the general director, as the case may be, may reject all bids or accept any one of them, even though it is not the lowest in price, without any bidder having the right to claim indemnification therefor.

When so specified in the corresponding decree, the management reserves the right to split up the bids and accept in part, such of them as it deems best; but in such case the terms fixed for the completion of the fractional parts of each work shall be stated in the blank forms.

ART. 17. As soon as a decision is reached regarding the bids submitted, the guaranty certificates referred to in article 12 shall be returned to the respective unsuccessful bidders.

If, within 30 days after the bids were opened, no decision has been made regarding them, the bidders may withdraw their bids and receive their guaranty certificates without right to indemnification.

The return of the deposits shall be effected by means of endorsement of the certificates by the official to whose order the funds were deposited.

PUBLIC RECORDING AND SIGNING OF CONTRACT

ART. 18. After a bid has been accepted, the corresponding public document must be drawn up, before the notary of the treasury department, within 10 days from the date on which the bidder was informed that the public document had been ordered drawn up. If the document should not be signed within the time indicated, through the fault or omission of the bidder, the decree accepting the bid may lapse, and in such case, the guaranty deposit shall be taken over by the (State Railway) management.

The public document shall be signed by the general director or the person designated for that purpose, and by the contractor or his duly authorized representative, after the guaranty referred to in article 12 has been deposited.

The expenses occasioned by the public document shall be borne by the bidder, who is obliged to deliver an authorized copy thereof to the general administration within the 20 days following its signature.

ART. 19. The public document shall contain the full text of the decree accepting the bid, and the express declaration that the contractor promises to execute the works which are the object of the contract, in accordance with the plans and specifications drawn up for that purpose, and the provisions of these regulations.

The contractor's declaration shall also include the renunciation of all rights granted to him by law, which are in conflict with the bases of the contract.

The bases of the contract and the technical specifications referred to shall be recorded together with the public document. It shall be established in the public document that the plans of the works covered by the contract are those signed by the contractor and that the originals are filed in the office of the general administration, sealed with the seal of said office, together with the documents containing the technical and administrative specifications drawn up in each case.

If the contractors are not Chilean citizens, it shall be expressly stated in the public document that they shall be considered as such for the purposes of the contract, and that, consequently, they can not call upon their respective governments for protection or prefer, under any pretext, claims through diplomatic channels. It shall also be stated in the public document that the contractor is establishing a legal domicile in Santiago for the purposes of any judicial dispute he may have with the State Railway administration.

ART. 20. In order to guarantee the fulfillment of the contract, the bidder must increase the deposit mentioned in clause (b) of article 12 to 10 per cent of the amount of the contract, and if the bid is more than 10 per cent below the official estimate, the deposit referred to must be increased until it equals the difference between the amount of the bid and 90 per cent of the official estimate.

ART. 21. The certificate of deposit corresponding to the accepted bid shall remain in possession of the (State Railway) administration until the final acceptance of the work. The contractor may be permitted, however, to substitute for his deposit, bonds of the mortgage credit office, which shall invariably be appraised at 10 per cent less than their market quotation. The interest on the guaranty shall belong to the contractor, unless said guaranty is incorporated with the funds of the administration for any of the reasons indicated in these regulations.

ART. 22. The additional guaranty which contractors whose bids are more than 10 per cent below the official estimate must furnish in accordance with clause (b) of article 12, shall be returned as soon as the works have been provisionally accepted as satisfactory to the administration.

Part II.—CONTRACT AND CONSTRUCTION OF WORKS

GENERAL PROVISIONS

ART. 23. The basis of the contract shall be the construction of all works in conformity with the final project approved by the council and provided for in the plans and specifications, which shall always be interpreted in the sense of the best and most correct construction of the work. The price of the works may not be different from that agreed on in the contract.

ART. 24. The foundations of buildings and engineering works, in so far as it is necessary to dig down below the levels fixed in the plans, shall be the object of an additional contract, at prices per unit to be fixed according to the material used.

If it is not necessary to sink the foundations to the level fixed in the plans, the general administration shall deduct from the contract price the proportional amount of the work not done.

ART. 25. Such detailed plans of construction as do not appear in the printed information concerning the project shall be furnished to the contractor on his written request.

ART. 26. All temporary works used in the construction of the work covered by the contract and for the maintenance of expeditious traffic on the lines and roads, facilitation of drainage, etc., shall be for the contractor's account.

All damages to the company or owners of property bordering on the railroad, as a result of the construction of the works, shall also be for the exclusive account of the contractor.

ART. 27. The company shall have sole charge of the procedure and bear the expense of expropriations effected for the track and its permanent buildings, in accordance with the plans approved.

ART. 28. The contractor may take the materials he needs from the quarries and sources of ballast belonging to the company, provided he does not injure the service, on the special conditions to be established in each case.

If the contractor shall find it convenient to take materials from lands other than those mentioned, he may request their expropriation, payment for said lands and all other expenses arising from the expropriation being for his account, and the land expropriated becoming the property of the company without the term of the contract being extended by reason of the difficulties and delay resulting from the expropriation.

ART. 29. The contractor may not transfer his contract without authorization of the council of administration or general director, as the case may be.

The guaranties of the contract and the personal responsibility of the contractor shall be effective in both cases.

ART. 30. The rise and fall of the price of materials and wages, changes in the country's economic situation, or any other circumstance not expressly provided for in the contract, shall not give either the administration or the contractor the right to demand an increase or decrease from the price named in the bid.

If, however, it is duly proven, in the judgment of the administration, that such rise or fall changes by 30 per cent or more the cost of the works remaining to be completed, in relation to the contract prices, the contractor or the administration may demand that the contract be liquidated, without cost to either party.

In this case the liquidation of the contract shall be made on the general conditions indicated in article 2005 of the Civil Code.

ART. 31. Expenses arising from accidents which injure, burn, or destroy the works, or which cause the loss of materials, shall be borne solely by the contractor, unless the work has been provisionally or finally accepted.

But even in such case, if the damage originates from some defect in construction work or of the materials used therein, the expense caused by the same shall invariably be borne by the contractor in accordance with clause 3 of article 2003 of the Civil Code.

The contractor may, at his own expense, insure works not yet delivered provisionally or finally.

ART. 32. The administration has the right to stop the work of construction when the needs of the public service make it advisable. When such stoppage does not exceed one month, the contractor shall have no right to indemnification.

When the stoppage exceeds this period, but does not exceed a year, the contractor may request a liquidation of the contract.

If the work is discontinued for more than one year, the contract is ipso facto canceled.

In the two latter cases the contractor shall have the right to receive an indemnification of 10 per cent of the value of the works remaining to be completed, reckoned at the prices fixed in the contract.

In these same two cases the contractor shall also have the right after the term of the guaranty has expired to demand that the provisional and final acceptance of the works be effected at once.

ART. 33. It is the duty of the technical inspection service to supervise the construction of the temporary engineering works built by the contractors in order to further or facilitate their tasks.

No temporary engineering work may be placed in service until the inspecting engineer authorizes it in writing, after a careful examination of the work.

The administration assumes no responsibility for such authorization, and in case of the total or partial destruction of the work, the expense of its reconstruction, if it is rebuilt, shall be for the sole account of the contractor.

ART. 34. In case of the contractor's death, the contract shall be canceled ipso facto, and its liquidation shall be undertaken in accordance with these regulations.

The provisions of the preceding clause do not prejudice the administration's right to accept bids made by the heirs for the continuation of the work.

ART. 35. When the administration leases rolling stock or other working equipment to the contractor, an itemized inventory of the same shall be made when it is delivered and it shall be returned in perfect working condition. Any injuries the equipment may have suffered during the period of construction, except such as were caused by the legitimate use and employment of the same, shall be for the account of the contractor, and the amount shall be deducted from the last payment.

Such equipment shall be used and maintained in accordance with the administration's requirements regarding it, and with the orders issued by the inspecting engineer.

TERM AND FINES

ART. 36. The term fixed shall be understood to be continuous, without deduction of holidays, rainy days, etc., and shall be counted from the date on which the public document is signed.

The date of completion shall be the date of the record of provisional acceptance of the work covered by the contract.

The term shall not be extended except in a case regarded by the administration as one of force majeure.

In no case shall an extension of the term be retroactive for the purpose of commuting fines the contractor has incurred.

Stoppage of work as a result of rejection by the inspecting engineer of materials not fulfilling the conditions of the contract, shall not give the contractor the right to demand an extension of the term.

Nor is the necessity of reconstructing defective works accepted by the inspecting engineer as a reason for demanding an extension of the term.

ART. 37. In case changes involving increased work are made in the contract, the contractor shall have the right to receive an extension of time proportionate to the increase in value of the works, without prejudice to the premium granted by the contract.

ART. 38. If an extension of the term is granted to the contractor for any other reason, it shall be understood that the contractor thereby loses the right to receive the premium granted him by the contract for delivery of the works in advance of the time originally fixed, as extended in accordance with the foregoing article.

ART. 39. If the contractor exceeds the term fixed for completion of the works, he shall pay the fine imposed in the conditions of the bid.

The fine referred to in the preceding sentence shall be imposed administratively, and deducted from the guaranties and amounts retained by the administration.

DELIVERY OF PLANS, STAKING OUT AND BEGINNING OF WORK

ART. 40. Before beginning work, and at the request of the contractor, the administration shall deliver to him, taking an itemized receipt therefor, a copy of all plans and documents prepared for the construction of the work. Such plans shall bear the contractor's signature and the general administration's seal.

ART. 41. The inspecting engineer shall advise the contractor of the date of such delivery and shall fix, within the 10 days following the delivery, the date of staking out the works and that of beginning on them and of commencement of the term.

A record in triplicate shall be made of the delivery of the land, which shall be signed by the contractor and inspecting engineer. A copy of this document shall be sent to the general administration and another shall be filed in the office of the inspecting engineer.

ART. 42. The inspecting engineer shall deliver to the contractor the route all staked off and the data regarding levels. The contractor must verify the staking off and the data regarding grades. When the administration deems it advisable, the route as staked off and data regarding differences of level shall be delivered in sections or parts.

When delivery has been made the contractor must return or keep the stakes and data regarding levels, and can not prefer any claim on account of errors in the operations referred to.

The inspecting engineer shall advise the contractor in writing of the date on which delivery of each section of the route already staked off is to be made.

In each case, a record of the said delivery shall be made, which shall be signed by the inspecting engineer and the contractor.

ART. 43. The contractor can not begin any work except on the land delivered to him.

If, for any reason, the administration can not deliver the land within three months after the date of the signing of the contract, the contractor is authorized to demand that the contract be canceled, and the administration must take over the materials the contractor had purchased, at their invoiced price.

ART. 44. If the contractor does not begin work within the 10 days following the initial date of the term, the administration may declare the contract canceled and cash the corresponding guaranty. The same course shall be adopted if the value of the work performed does not come to 15 per cent of the amount of the contract on completion of 30 per cent of the term, or 30 per cent on completion of 70 per cent of the term.

In either case the guaranty and moneys held back by the administration shall remain in its possession in order to meet the possibly greater cost of the work if carried out by the administration or another contractor, in accordance with the respective plans.

PROGRESS OF THE WORK

ART. 45. The contractor may not, of his own accord, make any change in the route, plans, or specifications forming the basis of the contract, and he must rebuild the works or replace the materials which, in the inspecting engineer's opinion, do not fulfill the conditions of the contract.

If the dimensions of the works constructed by the contractor, or the materials employed therein, do not wholly conform to those indicated in the plans and specifications, the inspecting engineer may order their immediate demolition. However, if such dimensions do not injure the stability or appearance of the works, a sum proportionate to the difference between the work actually performed and that required by the contract, plus 50 per cent, shall be deducted from the contract price, and no extra amount shall be paid if more work is done than the contract requires.

ART. 46. After beginning the work, the contractor must prosecute it at a rate of progress proportionate to the time allowed and the importance of the work.

Even when the average number of laborers to be employed by the contractor is fixed in the bases of the contract, the general administration may order this number increased to the extent it deems necessary in order to complete the work within the stipulated time. The contractor must comply with this order within the time set by the inspecting engineer, which shall not be less than 15 days.

Otherwise, the administration may declare the contract canceled and cash the guaranty.

ART. 47. The materials must be of the quality and from the quarry or factory indicated in the contract, and, in default of express stipulation, of the best quality and from the best source.

Before such materials are used, the inspecting engineer must be notified in order that he may, in view of the analysis and tests made, decide as to their acceptance or rejection.

If, however, during the period of construction or the term during which the guaranty is effective, it is proven that material accepted as good by the inspecting engineer has actually turned out to be poor, the contractor must replace it and tear down and rebuild, on his own account, the works in which it has been used.

ART. 48. The contractor must take the rejected materials away from the place where the work is going on and put it, within three days, in the place designated by the engineer.

If, for any reason, the contractor does not take the rejected materials away within the time fixed, the engineer may order the construction work affected to be stopped, and suspend the drawing up of the schedule of payments.

A discontinuance of the work for more than 15 days gives the administration the right to declare the contract canceled and incorporate the guaranty with the general national receipts.

ART. 49. The contractor is absolutely forbidden to transfer or sell, without the authorization of the administration, materials from the quarries or lands delivered to him by the administration.

ART. 50. The materials from expropriated houses, farms, etc., shall belong to the administration and shall be removed by the contractor and placed at the disposal of the inspecting engineer.

ART. 51. As soon as the contractor has completed the excavations, he shall, at least 48 hours in advance, request from the inspecting engineer, in writing, the necessary permit for beginning the foundations.

The inspecting engineer, personally or through some other employee of the inspection service, shall proceed to examine them (the excavations) and note the exact levels of the land and bottom of the excavations, and he shall, by means of a service order, authorize the foundations to be begun or order the excavations continued to the extent necessary.

ART. 52. Every communication, request, etc., relating to the work, must be presented to the inspecting engineer, and no attention shall be paid to any document not passing through his hands.

PAYMENTS AND AMOUNTS WITHHELD

ART. 53. In order to facilitate construction, the administration shall make partial payments in installments, the amount of which may not be less than the amount of the contract divided by the number of months in the term stipulated in the bases of the contract.

At least one month must elapse between the payment of one installment and that of the next.

The rails and accessories shall be paid for at their duly verified invoiced price, provided that the latter be not greater than the contract prices, as soon as they are left at the points indicated and their use has been authorized by the general administration; the balance of the price shall be paid as soon as the track is laid. The steel material for the metallic superstructure of bridges having a span of more than 10 meters, shall be paid for as follows: 50 per cent as soon as the steel pieces are deposited at the places indicated in the special bases of the contract, and the balance as soon as they have been mounted, painted, and approved.

The rails and metallic track accessories and steel material for the bridges shall not be paid for until the general administration has received a certificate from the technical inspector in the factory or from the administration's representative, if the bridge comes from a domestic factory, in which it is stated that said materials fulfill the requirements required by the corresponding documents.

No payment shall be made for materials found on the site of the work, with exception of those indicated in this article.

The partial payments for works covered by the contract shall in no wise constitute acceptance and approval of the same, and this procedure shall not be regarded as completed until provisional acceptance of all work covered by the contract, in accordance with article 77.

In estimating the amount of labor performed, before such labor, on any work or part thereof, has reached the value originally fixed, unit prices reckoned as

indicated in the following article shall be applied to the amount of the work executed in accordance with the plans.

ART. 54. In reckoning the installments, the prices per unit of the different works shall be obtained by reducing or increasing the unit prices of the official estimate by the same ratio in which the bid reduced or increased them as compared with said estimate.

ART. 55. The survey of the works completed, for the purpose of establishing the amount of the payments, shall be made by the inspecting engineer in the presence of the contractor or his representative, and the statements showing the amount shall be signed by the engineer inspecting the work and the contractor, and visaed by the general administration.

ART. 56. Every payment made to the contractor for works not included in his original contract, and every deduction for rent of rolling stock, etc., which are connected with the work covered by the contract, must appear in the corresponding statements and show the authorization preceding the execution of said works.

ART. 57. From each installment of the payment referred to in article 53, there shall be deducted 10 per cent as a special guaranty for the proper execution of the works.

This special guaranty does not exclude the others forming the surety of the contract.

When the amounts held on deposit in accordance with the foregoing article exceed 5,000 pesos, the contractor may demand that bonds be substituted for them in the manner established in article 21.

ART. 58. Payments of installments on the works shall be made in the kind of money stipulated in the contract, or its equivalent in current money.

ART. 59. If, 30 days after the general administration has authorized payment of an installment, it is not yet paid, the contractor has the right to collect interest at 6 per cent on the net amount to be paid, counting from the date on which it was due.

MODIFICATIONS OF CONTRACT

ART. 60. The administration reserves the right to order changes made in the works covered by the contract, or new works constructed, which alter, by not more than 15 per cent, more or less, the total amount of the contract, and the contractor must execute said modifications or construct such works. The authorization of such modifications or new works shall not be valid unless approved by the council, by a two-thirds vote of its members.

If the changes, according to the prices referred to in article 54, involve a reduction of the total price agreed on, the contractor shall have the right to collect 15 per cent of the amount of said reductions.

If, on the contrary, they involve an increase in cost, he shall have the right to be paid for the excess and be allowed a proportional extension of the term of the contract.

When orders are given for the construction of works or employment of materials of kinds not provided for in the contract, the prices thereof shall be agreed on in advance between the general administration and the contractor.

SUPERVISORY INSPECTION AND THE CONTRACTOR

ART. 61. The administration shall appoint an engineer, who shall be its representative at the works, and the personnel it deems advisable for the purpose of supervising the fulfillment of the contract and the proper construction of the works.

ART. 62. The inspecting engineer shall keep a special book for the service orders he gives the contractor.

In this book shall be kept a copy, showing date and order number, of all the service orders referred to. The contractor or his representative shall receipt every communication delivered to him and shall sign, at least every other month, the book of service orders below the last order. His signature shall signify that he knows all the preceding orders in the book.

The contractor shall enter the claims he deems just in the same book. The administration shall not consider any claims other than those entered in the service order book within 15 days from the date of the trouble.

ART. 63. The contractor must comply with the service orders issued to him by the inspecting engineer, provided that they are in writing and in accordance with the terms and proposals of the contract.

The contractor may appeal to the general administration from decisions made by the inspecting engineer while the work is going on, and the administration shall issue a brief and summary decision thereon.

If the contractor's claim amounts to more than 5,000 pesos, or if the amount thereof is indeterminate, the decision shall devolve upon the council.

If, after the matter has been decided as provided in the foregoing article, the contractor refuses to obey the orders issued, the administration may, after notifying him in writing, use the sums retained and the guaranty deposit, if necessary, in order to have such orders executed.

It may also, if the matter is sufficiently serious, declare the contract canceled after giving notice thereof eight days in advance.

In such case, the sums held back shall be used in carrying out the orders, and the deposit guarantying fulfillment of the contract shall belong wholly to the administration.

ART. 64. The contractor, or his technical representative designated in the bid, must personally direct the work, and can not absent himself from the site of the work without leaving a substitute accepted by the inspecting engineer in advance.

If the absence is to last more than 15 days, the designation of the substitute must be approved by the general director.

If the absence is to last more than two months, the designation of the substitute must be approved by the council.

When the administration deems it advisable so to demand, the contractor's representative must be an engineer holding a diploma from a reputable university, and have had at least two years' experience in the construction of works like those covered by the contract. The administration may, if the nature of the work makes it advisable, require that the contractor maintain, in charge of the work, the number of engineers necessary for proper execution of the works.

ART. 65. The administration reserves the right to demand, when it deems best, that the representative be changed, and the contractor must immediately put an end to the latter's activities and propose in his place a person approved by the administration and, in the meantime, take personal charge of the work.

ART. 66. The contractor, or his representative in charge of the work, must accompany the administration officials whose duty it is to inspect or examine the works.

ART. 67. When the examining inspectors, or the engineers commissioned by the administration to act as such, inspect the works under construction, records of their inspection in triplicate shall be made, and in them shall be entered the observations or requests made by the contractor and inspecting engineer.

The records shall be signed by the contractor, the inspecting engineer, and the examiner.

A copy of this record shall be inserted in the book of service orders, another given the contractor, and the third sent to the general administration for the usual purposes.

RELATIONS BETWEEN CONTRACTORS AND LABORERS

ART. 68. The contractor can not, in any case, delay the payment of wages or other compensation due the workers more than 15 days. Such payment shall be made in cash.

ART. 69. If the contractor establishes a store for the sale of provisions and other goods to the workers, he can not sell alcoholic drinks in such a store, and he is strictly forbidden to pay them in counters or promissory notes, or with orders on provision stores or wine shops. The prices of goods sold by him may not exceed the cost price by more than 15 per cent.

ART. 70. If it is necessary to furnish buildings for lodging the workers and employees, the contractor must see that they are arranged in accordance with the rules of hygiene.

ART. 71. The contractor shall turn in monthly to the inspecting engineer a pay roll of the workers employed by him, in which the occupation and number of days worked during the month shall be indicated for each trade group.

ART. 72. If the contractor does not comply with the provisions of article 68, the administration is empowered to pay, in the presence of a notary public, the wages or other compensation due the workers and employees, as well as the expenses arising out of this proceeding, charging the same to the nearest installment of the payment.

This act shall be carried out administratively, with the contractor's books and the pay rolls given by the latter to the inspecting engineer at hand.

ART. 73. The contractor, in the execution of the work, must adopt all the measures of safety and hygiene necessary for guarding the life and health of the employees and workmen, and the indemnities paid to the employees and workers disabled by accidents not solely due to their own fault, shall be for the contractor's account. When the employee or worker dies as a result of the accident, the indemnity shall be paid to his heirs.

ART. 74. The indemnities mentioned in the foregoing article shall be as follows:

(a) The widows, children, or parents of workers or employees killed by accident while at work shall be indemnified by a sum equal to three hundred and sixty-five times their daily wages. If the laborer was employed on piecework or job work, the indemnity shall be equivalent to three hundred and sixty-five times his average daily pay;

(b) Workers disabled totally and permanently shall be indemnified by a sum equal to that fixed by the foregoing article in case of death;

(c) Workers permanently, but not totally, disabled shall be indemnified by a sum equal to one-half of that indicated in the preceding clause;

(d) Workers or employees suffering ordinary accidents incapacitating them temporarily for work, shall have the right to a daily wage or payment equal to one-half of that they were receiving at the time of the accident, until their complete recovery, but not exceeding one year.

ART. 75. If the contractor does not comply with the provisions of the foregoing article, the general administration shall proceed to make the payments due and shall charge the amount to the contractor, deducting it from the guaranty deposit and keeping a special account which shall be added up at the final liquidation.

ART. 76. The inspecting engineer is charged with seeing that the obligations imposed on the contractor in the preceding articles are fulfilled, and it is his duty to determine whether the accidents occurring during work are or are not owing to lack of the necessary precautions.

ACCEPTANCE OF THE WORKS

ART. 77. When the works have been completed, a committee shall be appointed in order to accept them provisionally, and the engineer who has inspected their construction shall advise said committee regarding acceptance.

This committee, after examining the bases of the contract and the strength tests prescribed therein, shall investigate the quality of the materials and the construction of the works and shall draw up a record in triplicate which shall be signed by all its members and by the contractor.

A copy of the record shall be retained by the contractor, another by the inspecting engineer, and the third shall be sent to the general administration for publication in the *Boletín de Servicio*.

Together with the last copy shall be sent a complete historical summary of the nature, importance, cost, and means of execution of the works, the chief difficulties encountered in the course of the work and the way in which these were overcome, and, on a separate sheet, remarks concerning the way in which the contractor has carried out the contract.

ART. 78. If, as a result of the committee's investigation, it is found that the works have not been constructed in conformity with the plans and professional rules, and that the materials are defective or work remains to be done amounting to more than 1 per cent of the contract, the committee shall not accept the work. The contractor may not evade his responsibility for works found defective or refuse to rebuild them on the pretext of their having been accepted by the inspecting engineer.

ART. 79. When the works remaining to be constructed do not hinder the use of the work covered by the contract, or when the defects mentioned in the preceding article do not affect the solidity of the work and may be easily remedied after their provisional acceptance, the committee shall proceed to construct or remedy them, as the case may be, making the proper reservations. In such case, the guaranty term may be extended by the administration by the amount of time used in remedying the defects.

The contractor must construct these works or make these repairs within the time fixed by the administration, and the sums retained by the latter shall not be returned to him in the meantime. If the contractor does not construct the works or make the repairs within the time set, the administration shall do so itself in the way it deems best, and shall deduct the cost from the pending sums withheld.

ART. 80. If, after they have been provisionally accepted, it is found that the works have been constructed without defect and in accordance with the plans, specifications, and professional rules, three-quarters of the sums withheld shall be returned to the contractor. The remaining quarter shall be retained until their final acceptance.

ART. 81. The final acceptance shall be effected in the same way and with the same formalities as the provisional acceptance, after the lapse of the guaranty term stipulated in the bases of the bid. This term does not prejudice the ordinary guaranty term of 10 years established for every work by article 2003, paragraph 3 of the Civil Code.

ART. 82. Final acceptance having been effected without objection, the final statement of liquidation shall be drawn up. A public document canceling the contract shall also be drawn up and after these formalities have been complied with, the sums withheld and the contract guaranty deposits shall be returned to the contractor.

In a session of the honorable Council of Administration held on August 3, 1914, in approving the draft of the Regulations for the Construction of Works on the State Railways, it was decided that the following should appear in the record, without changing the respective clauses of the bases:

1. That the power conferred by section (d) of article 3 must be so exercised that the administration does not bind itself to furnish any materials other than those at its disposal.

2. That 10 per cent of their amount shall be deducted from the payments referred to in paragraph 3 of article 53, as from other installments of the payment.

3. That it shall be stated in every case that the works are to be constructed, provided that the funds at the disposal of the administration are sufficient therefor.

Appendix G.—CONTRACT FOR RAILWAY REFUNDING LOAN

The following contract is concluded, this 23d day of January, 1928, between the Republic of Chile (hereinafter referred to as the "Republic"), acting through its ambassador extraordinary and plenipotentiary to the United States, His Excellency Senor don Carlos Davila, party of the first part, The National City Co., a corporation of the State of New York, in the United States of America (hereinafter referred to as the "company"), acting through its duly authorized representative, its president, Charles E. Mitchell, party of the second part, and the National City Bank of New York, a national banking association of the United States of America (hereinafter referred to as the "bank"), acting through Charles E. Mitchell, its duly authorized representative, its president, party of the third part:

ARTICLE I. The Republic covenants with the company that it will cause to be duly sanctioned and created, in conformity with the constitution and laws of the Republic of Chile, an issue of railway refunding sinking fund 6 per cent gold external bonds of the Republic (hereinafter referred to collectively as the "bonds") in the aggregate principal amount of \$45,912,000, in gold coin of the United States of America, constituting and to constitute an external loan of the Republic; and the Republic hereby appoints the bank to act as its fiscal agent for the loan, with the duties and powers herein set forth.

ART. II. The bonds of the loan will be dated January 1, 1928, will mature January 1, 1961, will bear interest from January 1, 1928, at the rate of 6 per cent per annum, payable semiannually on July 1 and January 1 in each year.

Definitive bonds will be issued in the denominations of \$1,000 and \$500, in such amounts as to each denomination as the company may designate, and shall be in negotiable form, payable to bearer and transferable by delivery. Any definitive bond may, however, be registered in the owner's name on books to be kept by the bank at its head office in the borough of Manhattan, City of New York, United States of America, such registration being noted on the bond by the bank as fiscal agent, after registration no further transfer of such bond shall be valid unless such transfer be registered on the said books by the registered owner in person or by duly authorized attorney and similarly noted on the bond; but such bond may be discharged from registry by being in like manner transferred to bearer, and thereupon transferability by delivery shall be restored. Definitive bonds shall continue to be subject to successive registrations and transfers to bearer at the option of their respective holders or registered owners.

Definitive bonds shall have coupons attached, representing the respective installments of interest to become due thereon, which interest coupons shall be and remain payable to bearer and transferable by delivery, notwithstanding any registration of the bonds; and installments of interest falling due on any definitive bond at or before the maturity thereof shall be paid only upon the presentation and surrender of the respective coupons therefor as they severally mature, and shall be so paid without the presentation of the bond itself.

Definitive bonds shall be executed on behalf of the Republic with the facsimile signature of the Minister of Finance, shall be countersigned with the autograph signature of its ambassador extraordinary and plenipotentiary and shall bear a facsimile of the seal of the Ministry of Finance of the Republic impressed or imprinted thereon. Interest coupons shall be executed with the facsimile signature of the said Minister of Finance.

Pending the preparation of definitive bonds, the Republic shall issue one or more provisional or temporary bonds, in negotiable form, payable to bearer and transferable by delivery, without interest coupons and not susceptible of registration. Such provisional or temporal bonds shall be issued in the denomination of \$1,000 or of such multiple or multiples thereof as the company may designate, and shall be executed on behalf of the Government by the ambassador extraordinary and plenipotentiary under the seal of the Republic's embassy at Washington. Each such provisional or temporary bond shall be exchangeable, without charge to the holder thereof, for a like aggregate principal amount of other provisional or temporary bonds of any other denomination or denominations as the company may from time to time request, and shall also be exchangeable, without charge to the holder thereof, for a like principal amount of definitive bonds of the loan with all unmatured interest coupons attached, when such definitive bonds are prepared and ready for delivery. Interest on each such provisional or temporary bond shall be payable only upon presentation thereof for the notation of such payment thereon.

Each and every bond of the loan (whether provisional or definitive) shall be authenticated as such by the bank as fiscal agent; and no bond shall be valid or obligatory for any purpose until so authenticated.

The text of the bonds and their interest coupons shall be in the English language only, and definitive bonds shall be printed from steel engraved plates in such manner and form, approved by the company, that the same shall be eligible for listing on the New York Stock Exchange.

ART. III. The bonds of the loan outstanding from time to time shall not be subject to redemption prior to maturity except through the operation of the sinking fund hereinafter provided for. As and for a sinking fund for the amortization of the principal of the bonds at or prior to maturity, the Republic covenants that it will remit or cause to be remitted to the bank, in the Borough of Manhattan, city of New York, United States of America, on May 20, 1928, and semi-annually thereafter on November 20 and May 20 in each year, so long as any of the bonds remain outstanding and unpaid, a sum which, in the case of each sinking-fund payment, shall be equal to the amount due on that particular sinking-fund payment date as set forth in Schedule A hereto attached, in gold coin of the United States of America, or its equivalent in other currency of the United States of America. The bank, acting on behalf of the Republic, shall select by lot, in such manner as the bank may deem to be fair, for redemption at 100 per cent of the principal amount thereof, on the next interest date, an amount of bonds on the loan of the principal amount set forth in Schedule A opposite the sinking-fund payment date in question. The Republic may on any such sinking-fund payment date, make payment of \$1,000, or any multiple thereof, in excess of the sinking-fund payment provided in Schedule A for such date and the excess payment so received by the bank shall constitute an additional sinking fund and be applied on the next interest payment date by the bank to the redemption of bonds by lot at 100 per cent of the principal amount thereof. So long as any bonds are outstanding any excess payment so made shall not affect the amount of payment to be made on any subsequent sinking-fund payment date as set forth in Schedule A.

Notice of redemption shall be given by publishing the same at least once a week for four consecutive weeks in each of two newspapers of general circulation, published in the Borough of Manhattan, city of New York, United States of America, the first publication to be at least 30 days prior to the date designated for redemption and in case any of the bonds so to be redeemed shall at the time be registered, by mailing a copy of such notice on or before the date of the first publication thereof to each registered owner of such bonds at his address appearing upon the regis-

tration books, as kept by the bank. Such mailing, however, shall not be a condition precedent to such redemption, and failure to mail such notice or to receive the same shall not affect the validity of the proceedings for the redemption of the bonds. Such notice shall set forth the serial numbers of the bonds selected for redemption (except in the case where all the outstanding bonds are to be redeemed) and shall call upon the respective holders and owners of the bonds to surrender same, with all unmatured interest coupons attached, at the head office of the bank, in the Borough of Manhattan, city of New York, United States of America, for redemption at the redemption price payable on the date designated therefor as above provided, and shall give notice, also, that interest on such bonds shall cease from and after such designated date.

Notice of redemption having been given as in this Article III provided, and an amount in cash sufficient to redeem all the bonds so designated for redemption having been deposited with the bank on or before the designated redemption date, the said bonds, on such date, shall become due and payable at the said head office of the bank, at the redemption price then payable, as above provided, and, upon presentation and surrender thereof, with all interest coupons maturing subsequently to the said redemption date, and, in the case of bonds which shall at the time be registered, accompanied by duly executed assignments or transfer powers, such bonds shall be paid and redeemed at the said redemption price. If cash sufficient to redeem all the bonds so designated for redemption shall have been deposited with the bank for that purpose, as herein provided, the said bonds shall cease to bear interest after the date so designated for redemption; but all interest coupons pertaining thereto, which shall have matured on or prior to that date, shall continue to be payable to the respective holders thereof, but without interest thereon.

ART. IV. Any and all bonds purchased, paid, or redeemed pursuant to any of the provisions of this contract shall forthwith be canceled by the bank, acting as fiscal agent for the loan, and shall be permanently retired; and no further bonds of this loan shall be issued in lieu thereof.

ART. V. The Republic covenants, and will so covenant in the bonds, that both principal and interest of the bonds shall be payable at the head office of the bank, in the Borough of Manhattan, city of New York, United States of America, in gold coin of the United States of America of or equal to the present standard of weight and fineness, and shall be paid in time of war as well as in time of peace, whether the respective holders or owners of the bonds or of the interest coupons pertaining thereto are citizens of a friendly or a hostile state, without requiring any declaration as to the citizenship or residence of such holders or owners, or as to the length of time they have been in possession of the bonds, or of such interest coupons, as the case may be, and without deduction from either principal or interest for or on account of any taxes or duties now or hereafter imposed or levied by or within the Republic or by or within any political subdivision or taxing authority thereof. The Republic covenants that the necessary legislation enabling the payment of the bonds and the coupons pertaining thereto without such deduction from principal or interest has been duly and lawfully enacted and the Republic furthermore agrees to pay any taxes or duties to which this contract may be subject within the Republic.

ART. VI. The Republic covenants, and will so covenant in the bonds, that, if in the future it shall sell, offer for public subscription or in any manner dispose of any bonds, or contract or create any loan (internal or external), secured by lien or charge on any revenue or asset of the Republic, the bonds of this loan shall be secured equally and ratably therewith.

ART. VII. The Republic will covenant in the bonds that all acts, conditions, and things required to be done and performed and to have happened precedent to and in the issue of the bonds, have been done and performed and have happened in due and strict compliance with the constitution and laws of the Republic.

ART. VIII. The Republic agrees that, in case any bond or its interest coupons (if any) shall be mutilated, destroyed, or lost, the Republic will issue, and will thereupon cause the bank to authenticate and deliver as fiscal agent, a new bond of like denomination, tenor and date, in exchange and substitution for and upon the cancellation of the bond and its interest coupons (if any) so mutilated, or in lieu of and in substitution for the bond and its interest coupons (if any) so destroyed or lost, but only upon receipt, in each case, of indemnity satisfactory to the Republic and to the bank as its fiscal agent for the loan, and, in case of the destruction or loss of any bond or interest coupons, upon the receipt, also, of evidence satisfactory to the Republic and to the bank of such destruction or loss.

ART. IX. The Republic covenants with the company that it will use the proceeds of the loan after the payment of the expenses of the loan for the following purposes:

(a) The redemption of the outstanding 8 per cent bonds of the \$24,000,000 loan contracted in 1921 under law No. 3718 dated January 17, 1921;

(b) The redemption of the outstanding 8 per cent bonds of the \$10,500,000 loan contracted in accordance with law No. 3738 dated March 5, 1921.

(c) Payment of the credit of \$5,800,000 contracted by the State Railway System with the National City Bank of New York, Santiago, Chile, in accordance with the authorization contained in decree laws No. 221 and 287 dated January 22, 1925, and March 2, 1925, respectively.

(d) Repayment of borrowing made by the treasury from funds originally destined for harbor improvements and other public works and for the purchase of additional equipment and supplies for the Chilean State Railways.

ART. X. The Republic agrees to issue and sell to the company, for the purchase price hereinafter named, the said \$45,912,000, aggregate principal amount of bonds of the loan, as herein described, and to deliver to the company a temporary bond or bonds of the loan in the said aggregate principal amount between the hours of 10 a. m. and 12 m., on February 7, 1928, at the head office of the bank in the Borough of Manhattan, city of New York, United States of America. Subject to the approval of its counsel, as hereinbefore provided, the company agrees to purchase the said bonds at the said purchase price hereinafter named, upon the delivery to it of the said temporary bond or bonds at the time and place herein designated; provided, that at the option of the company, delivery of the temporary bond or bonds may be deferred for a period or periods not exceeding 15 days in the aggregate.

The purchase price to be paid upon the delivery of such temporary bond or bonds shall be the sum of \$41,091,240, being the equivalent of 89½ of the aggregate principal amount of the bonds, to which shall be added a sum equivalent to interest on such principal at the rate of 6 per cent per annum from January 1, 1928, to the date of delivery of the temporary bond or bonds to the company.

Payment to the Republic under any of the provisions of this Article X shall be made by depositing the amount thereof with the bank for account of the Republic. The proceeds so deposited with the bank for account of the Republic shall be disposed of as follows:

(a) On March 1, 1928, provided the Republic shall have given the necessary notice of call for redemption there shall be transferred in New York Clearing House funds to Blair & Co. in the Borough of Manhattan, city and State of New York, \$8,662,500 or so much thereof as may be necessary to effect the redemption of the outstanding 8 per cent bonds of the \$10,500,000 loan contracted in 1921 under law No. 3738 dated March 5, 1921.

(b) On May 21, 1928, provided the Republic shall have given the necessary notice of call for redemption, there shall be transferred in New York Clearing House funds to the Guaranty Trust Co. in the Borough of Manhattan, city and State of New York, \$16,830,000, or so much thereof as may be necessary to effect the redemption of the outstanding 8 per cent bonds of the \$24,000,000 loan contracted in 1921 under law No. 3718 dated January 17, 1921.

(c) On maturity of the credit contracted by the State Railway system with the National City Bank of New York, Santiago, Chile, in accordance with the authorization contained in decree laws Nos. 221 and 287 dated January 22, 1925, and March 2, 1925, respectively, there shall be paid \$5,800,000 to the National City Bank of New York, Santiago, Chile.

(d) Balance of said proceeds shall be paid to or on order of the Republic when and as necessary to meet the purposes specified in paragraph (d) Article IX.

ART. XI. In consideration of the purchase of the bonds by the company, the Republic agrees with the company as follows:

(a) The Republic will promptly comply with all reasonable requests of the company for such information concerning the Governmental organization and administrations, laws, finances, and general trade and industrial conditions of the Republic, and other similar information, as the company may reasonably deem necessary or useful in connection with any application to have the bonds of the loan listed on the New York Stock Exchange, if the company deems such listing to be desirable, or in connection with the sale or offering of the bonds to investors; and the Republic hereby authorizes and instructs its ambassador extraordinary and plenipotentiary to sign in its name, or otherwise, any such application to have the bonds listed on the New York Stock Exchange and all other appropriate

statements or circulars to be used in connection with such listing or in connection with the sale or offering of the bonds to investors.

(b) The Republic will pay, as part of the expenses in connection with the service of the loan, all expenses incident to the preparation and issue of both temporary and definitive bonds and any interim certificates representing the same which may be issued by the company, including, among other things, the cost of printing and engraving such bonds and interim certificates (if issued), the fees of the bank as fiscal agent for authenticating or registering bonds, the charges for the use of any mechanical device employed in the signing, execution, countersigning, or authentication of bonds and interim certificates, the expenses of the company necessarily incurred in exchanging its interim certificates (if issued) for definitive bonds, the cost of listing the bonds on the New York Stock Exchange (if the company deems such listing to be desirable), any reasonable expenses incurred in cabling of this contract or prospectus letters, and the charges and fees of the Republic's own counsel and counsel for the company. The Republic authorizes the company to approve any and all such bills or statements as may be rendered for or in respect to any expenses and charges of the foregoing character, and authorizes and requests the bank as fiscal agent for the loan to set aside from the proceeds of the loan the sum of \$92,000, and to pay therefrom any and all such bills or statements as may be approved in writing by the company from time to time. Any balance of the said sum which shall remain with the bank after all such expenses and charges shall have been paid or provided for shall be transferred to the credit of the Republic's account with the bank.

(c) Prior to August 1, 1923, the Republic will not offer or cause or suffer to be offered for sale or public subscription in the United States of America or the Dominion of Canada any additional obligations in respect to the payment of which the Republic shall or may be liable or responsible, directly or indirectly, as obligor, guarantor, or otherwise, unless, in the opinion of the company, the bonds of this loan shall have been satisfactorily distributed.

(d) If during the period of 30 days after the signing of this contract the investment market in the United States of America or the Dominion of Canada shall be affected by any financial, commercial, or political condition or circumstance, by acts of God, or by conditions of the nature of force majeure, so as to preclude, in the judgment of the company, the successful sale and distribution of the bonds of the loan to investors, or so as to render the offer of the same by it to be inadvisable, the company shall have the right, in its discretion, to terminate its obligations under this contract, by giving notice of such termination to the Government by cablegram addressed to the Minister of Finance and, in any such case, the parties thereto shall thereupon be mutually and severally released from any obligation or duty under or in respect to this contract.

ART. XII. Within 45 days after the close of each six months' period ending July 1 and January 1, respectively, in each year, the bank shall render to the Republic a statement of account covering such period, setting forth in reasonable detail all receipts and all payments and expenses made or incurred by the bank as fiscal agent for the loan during the said period, together with a calculation of the sums due to the bank, as hereinafter provided, as compensation for its services as such fiscal agent rendered during such period.

ART. XIII. As part of the expenses of the service of the loan, the Republic will pay to the bank, from time to time, as compensation for its services as fiscal agent for the loan, in addition to its fees for authenticating and registering bonds, a sum equivalent to one-quarter of 1 per cent of all sums paid as interest on the bonds of the loan, whether upon the presentation and payment of interest coupons or otherwise, and a sum equivalent to one-eighth of 1 per cent of the principal amount of all bonds of loan paid, or redeemed by it as fiscal agent. The Republic will also promptly pay or cause to be paid to the bank all other sums due and payable to it for the service of the loan, including, among other things, any and all expenses incurred and paid by it for printing and advertising, incineration of bonds and coupons, cost of exchange and remittance of funds, brokerage charges, postage, cable, telegraph, and telephone charges, charges of legal counsel, and all other usual or reasonable expenditures.

ART. XIV. The Republic agrees with the bank that any and all sums which may become payable for principal or for interest (except sinking fund installments as provided for in Article III) shall be placed on deposit with the bank in immediately available funds at its head office in the Borough of Manhattan, city of New York, United States of America, at least five full business days before the date on which such sums respectively become payable by the terms of this contract, and that any and all other sums and expenses payable by the Govern-

ment in connection with the service of the loan will be paid in due and strict conformity with the provisions therefor set forth in this contract, in gold coin of the United States of America, or its equivalent.

ART. XV. The bank will allow and pay to the Republic on all moneys received by the bank for or on account of any installment of the sinking fund, and remaining with it for 30 days, or more, interest from the thirtieth day after the receipt thereof to the date upon which the same shall be paid out, at a rate which shall be 2 per cent less than the current discount rate of the Federal Reserve Bank of New York for prime banker's acceptances maturing within 90 days, but in no event at a rate less than 2 per cent per annum or more than 3 per cent per annum.

ART. XVI. The bank hereby accepts its appointment as fiscal agent for the loan and agrees to act as such under this contract, upon the terms and conditions herein set forth, including the following:

(a) If the bank shall at any time be in doubt with respect to its rights or obligations hereunder or with respect to the rights of any holder of any bond, the bank may advise with its legal counsel; and the bank shall not be answerable or responsible to the Republic for anything done or suffered by it in good faith in accordance with the opinion of such counsel or in the exercise of its reasonable discretion.

(b) The bank may resign at any time as fiscal agent, by mailing written notice of resignation to the Republic addressed to its Minister of Finance at Santiago, Chile, at least four weeks prior to the date upon which such resignation is to take effect, and by publishing notice of such resignation at least once a week for four consecutive weeks prior to such date in each of two newspapers of general circulation published in the city of New York, United States of America.

(c) In acting under this contract, the bank is solely the agent of the Republic and does not enter or assume any obligation or relationship of agency or trust for or with any of the holders or owners of the bonds or their interest coupons.

ART. XVII. Nothing in this contract expressed or implied is intended or shall be construed to give any person, other than the parties hereto, any right, remedy, or claim hereunder or by reason hereof or by reason of any covenant, stipulation, or condition herein contained.

ART. XVIII. This contract shall bind and inure to the benefit of the parties hereto, their respective successors and assigns. This contract shall be construed in accordance with the laws of the State of New York, United States of America.

ART. XIX. The form of the bonds and the legality of all proceedings in connection with the issue thereof and the sanction and creation of the loan shall in all respects be subject to the approval of counsel for the company.

In witness whereof, this contract is signed and delivered, in triplicate, in the city of New York, N. Y., the day and year first above written.

For the Government of the Republic of Chile;

(Signed) CARLOS G. DAVILA,
*Ambassador Extraordinary and Plenipotentiary,
of the Republic of Chile to the United States of America.*

For the National City Co.:

(Signed) CHARLES E. MITCHELL, *President.*

For the National City Bank of New York:

(Signed) CHARLES E. MITCHELL, *President.*

(Republica de Chile, Ministerio de Hacienda, documentos oficiales relativos al empréstito de consolidación de la deuda de los Ferrocarriles del Estado; oficina del presupuesto: Folleto No. 5, febrero de 1928.)

DECREE NO. 379, REGARDING THE REDEMPTION OF THE LOAN

FEBRUARY 16, 1928.

No. 379.

WHEREAS:

(1) By law No. 4160, dated August 11, 1927, the President of the Republic was authorized to contract for a loan that might yield \$41,000,000 whereof \$31,000,000 are for the account of the State Railway Co., and \$10,000,000 for the account of the treasury.

(2) By decree No. 118 dated January 20, 1928, the proposal of the National City Bank was accepted by which it would take the bonds of the said loan at 6 per cent interest and a minimum acceptance quotation of 89¼ per 100;

(3) By decree No. 311, dated February 8, 1928, the ambassador of Chile to the United States was authorized to sign the loan contract, and in the same decree an acceptance quotation of 89½ and a nominal value of issue of \$45,912,000 were named;

(4) In conformity with law No. 4160, the loan contract establishes the general distribution of the yield of the loan;

(5) On February 6, 1928, the National City Bank officially informed that, reckoned from that date the net product of the loan was available to the Republic;

(6) And it is proper to apportion the yield of the loan in conformity with the law and corresponding contract and to book the corresponding operations:

I HAVE APPROVED AND DECREE:

(1) The following amounts will be regarded as the definitive value of the operation of the contract entered into in virtue of the law No. 4156:

Nominal value-----	\$45, 912, 000
Yield of the issue on the acceptance quotation of 89.5-----	41, 091, 240
Plus interest at 6 per cent for 36 days, beginning with Jan. 1, the date of the bonds-----	275, 472
	<hr/> 41, 366, 712
Minus a reserve for the expenses of issue in accordance with Article XI, section "b" of the contract-----	92, 000
	<hr/> Balance available for distribution----- 41, 274, 712

(2) The net yield indicated as being \$41,274,712 shall be entered from this date under general revenues of the nation and of the general treasury of the Republic and its distribution ordered in the following form:

(a) As of March 1, 1928, there shall be deposited \$8,662,500 to the order of Blair & Co., city of New York, for the purpose of redeeming the bonds of 8 per cent in circulation of the loan of \$10,500,000 contracted for in 1921 in virtue of law No. 3738, dated March 5, 1921 (clause "a", Article X, of the contract).

(b) As of May 21, 1928, there shall be deposited \$16,830,000 to the order of the Guaranty Trust Co., city of New York, for the purpose of redeeming the bonds of 8 per cent in circulation of the loan of \$24,000,000 contracted for in 1921 in accordance with law No. 3718 dated January 17, 1921 (clause "b," Article X, of the contract).

(c) As of February 10, 1928, there shall be placed at the order of the State Railway Co., in the chief office of the National City Bank, city of New York, the sum of \$5,800,000, and the company, as of same date, shall order cancellation of the credit contracted for with the National City Bank, Santiago, Chile, in accordance with the authorization contained in the decree laws Nos. 221 and 287, dated January 22 and March 2, 1925, respectively.

(3) The balance of \$9,982,212 left over after compliance with the foregoing obligations is to be distributed as follows:

Railway company-----	\$4, 539, 851
Treasury-----	5, 442, 361
Total-----	<hr/> 9, 982, 212

The formation of each of these balances is detailed in the following articles 4, 5, and 6:

(4) The nominal value of the loan, amounting to \$45,912,000, shall be distributed as follows:

To the railway company-----	\$34, 713, 950
To the treasury-----	11, 198, 050
Total-----	<hr/> 45, 912, 000

The net yield of the loan, amounting to \$41,274,712, shall be distributed between the railway company and the treasury in the following manner:

To the railway company-----	\$31, 207, 709
To the treasury-----	10, 067, 003
Total-----	<hr/> 41, 274, 712

(5) The net balance for the railway company, the obligations of article 2 having been complied with, shall be determined as follows:

Net yield, for the account of the company-----	\$31, 207, 709
Less:	
Redemption of Blair bonds, including premium of 10 per cent--	5, 662, 500
Redemption of Guaranty Trust bonds, for which the company is responsible, including premium of 10 per cent-----	12, 205, 358
Credit cancellation of the National City Bank at Santiago---	5, 800, 000
	<hr/>
	26, 667, 858
Net balance for the State Railway-----	4, 539, 851

(6) The net balance for the treasury, the obligations referred to under article 2 having been complied with, shall be determined as follows:

Net yield, treasury share-----	\$10, 067, 003
Less redemption of Guaranty Trust bonds, for which the treasury is responsible, including premium of 10 per cent-----	4, 624, 642
	<hr/>
Clear balance for the treasury-----	5, 442, 361

(7) The general treasurer of the Republic shall immediately make available to the State Railway Co., in the form, on the date, and at the place to be designated by the latter, an amount of \$4,388,631 of the total of \$4,539,851 going to the company as net balance, leaving the sum of \$151,220 (75.61 per cent of \$200,000) deposited in the National City Bank of New York for subsequent settlement, the said sum to meet the adjustment between the theoretical and actual values of the conversion operations, and other expenses incurred by reason of the same conversion, and which may not have been taken into account on determining the values to which the present decree refers.

(8) The general treasurer of the Republic shall immediately make available, in the form and on the date determined most expedient, an amount of \$5,393,511 of the total of \$5,442,361 of the net balance going to the treasury, leaving an amount of \$48,780 (24.39 per cent of \$200,000) deposited in the National City Bank of New York for subsequent settlement, the said amount to meet an adjustment between the theoretical and actual values of the conversion operations and any other expenses resulting from the same conversion and which may not have been taken into account in determining the values to which the present decree refers.

(9) The National City Bank is authorized to invest the \$200,000 for expenses and adjustments referred to in articles 7 and 8, and to add to this amount interest and other amounts to be credited to the Republic in consequence of the conversion operations. The resulting balance of this account shall in due time be distributed by the General Treasurer of the Republic, after due previous examination by the comptroller general in the ratio of 75.61 per cent for the State Railway Co. and 24.39 per cent for the treasury.

(10) Orders of payment relating to the loan must be signed by the general treasurer of the Republic, approved by the comptroller general, and addressed to the office of the National City Bank, Santiago, Chile. As regards the investments of the \$200,000, reference to which is made in articles 7 and 8, no special order of the treasury will be required and the National City Bank may proceed directly with such payments, subsequently submitting the respective account.

(11) The loan service to which this decree refers shall be effected both as regards the treasury share and the share going to the State Railways directly by the general treasury of the Republic. The State Railway Co. shall deposit to that end in the general treasury of the Republic, at least five days before the date agreed on in the respective contract, the necessary amounts for such service, in dollars or in their equivalent, current money, at the quotation of the day, plus one per thousand in accordance with decree No. ----- dated February 7, 1928.

(12) Before March 1 next the State Railway Co. shall deposit in the general treasury of the Republic an amount of \$34,714, equal to one per thousand of the nominal value of the loan contracted in its favor in accordance with decree No. 396 dated February 16, 1928.

(13) The company and the general treasury of the Republic shall effectuate in the same form as they have done up to date, the service of the Blair loan

(law 3738). As regards the Blair loan, the final service will be that of paying the interest on May 1, without ordinary amortization on that date. The respective deposit must be made as of April 1.

As for the Guaranty Trust loan, the last service shall be that of paying interest as of August 1, without ordinary amortization on that date. The respective deposit must be made as of July 15. Reckoned from the dates indicated, both loans will have been settled, and those items which, for their service, are included in the ordinary budget corresponding to 1928, shall be united in one single title relating to "Funded loan of the debt of the State Railways."

Take cognizance of these, make note thereof, and communicate these presents.

CARLOS IBANEZ C.
PABLO RAMIREZ.

Appendix H.—GENERAL BASES FOR PURCHASE OF EQUIPMENT (1930) FOR ARICA-LA PAZ RAILWAY

Bids.—Bids shall be filed in triplicate on the special forms furnished by the railway, and must comply with the provisions of article 7, No. 125, of Law No. 4460.

Guaranty certificate.—Every bid must be accompanied by a guaranty certificate, in an amount equal to 2 per cent of the value of the equipment offered, to the order of the superintendent of the Chilean section of the Arica-La Paz Railway.

The amount of this guaranty certificate shall be increased to 8 per cent of the value of the materials accepted, if this is over 300,000 pesos, and if not, to 10 per cent of said value. Until these requirements are fulfilled, the bidder may not begin to deliver the equipment that has been accepted.

A guaranty certificate that a given merchant has filed with the railway for another pending bid shall not be accepted as guaranty of a bid, unless the railway has returned it to its owner on account of his faithful fulfillment of a prior contract.

Such guaranty certificates must comply with the provisions of article 7, No. 28, of Law No. 4460.

Prices.—The prices shall be fixed in legal money for the equipment delivered in the warehouses of the railway. Bidders who offer an article that is to be imported shall not include in its price the customs duties, dock charges, nor gagers' fees, which shall be at the charge of the railway.

If they quote prices on articles manufactured or sold in the country, they shall not include in the price dock or gagers' fees, which shall also be at the company's charge. With these exceptions, all other expenses incurred up to the time the goods are delivered in the company's warehouses shall be for the bidder's account.

Formulation of the bid.—The bidder should quote his prices separately per unit specified in each item, and not group several of them together, even though they are similar. The company reserves the right not to consider bids not made in accordance with these conditions.

Each bidder must also add up and find the totals of the various items of equipment he offers in order to show the total amount of his bid, and to make it possible to compute the amount of the corresponding guaranty.

C. i. f. quotations.—Such quotations will not be accepted. Therefore no bids submitted in this way will be considered.

Time of delivery.—Bidders must fix the date of delivery, except in the special cases indicated in each list. They must bear in mind, in regard to this, that the company wishes delivery to be effective as soon as possible.

Statement concerning manufacture.—Bidders shall state in their bids the name of the factory from which the equipment comes, or that of the mine, in case of bids relating to coal.

Payments.—Payment shall be made within the 30 days following the receipt of the equipment in the company's warehouses, and the corresponding commercial invoice containing the number and date of the decree accepting the bid must be presented there in triplicate.

Samples.—A sample or certificate of quality of all material or articles offered must be filed, except in the case of equipment, machinery, etc., when it will suffice to present plans, specifications, catalogues, and any other documents enabling them to be easily studied.

Samples may also be omitted, unless specifically requested, in case the bidder offers equipment which is strictly in accordance with the specifications or bases of the licitation. Every sample must be filed with the railway accounting depart-

ment in Arica at least three days before the bids are opened, and each one shall bear the bidder's name, that of the article, and date of the respective bid.

Inspection and acceptance of equipment.—Equipment shall be definitely accepted after the samples received have been tested, either in private laboratories or on the State Railways.

Rejection.—Equipment rejected on account of its poor quality or for any other cause must be removed from the company's warehouses within six days; if this is not done, it shall pay storage.

Cases of force majeure.—If these occur with regard to any contract, the contractors must advise the railway administration within 48 hours after they have occurred or been ascertained; if this is not done, they shall be disregarded. Cases of force majeure or accident must be proven by official documents satisfactory to the company.

Maintenance of bids.—Every bid must be maintained for at least 45 days. After this period the bidder shall have power to withdraw his bid; he must do so in writing, stating his reason therefor. If this is not done after 45 days, and before 50 days have elapsed after the opening of the bids, the offer shall be regarded as maintained for 30 days more. When this period has expired the bidder will again be permitted to withdraw his bid.

Fines.—Delay in delivering the equipment contracted for shall be punished by a fine of 2 per cent of the value of the delayed equipment for each fortnight, or fraction thereof, of delay in delivery.

The amounts of the fines shall be stamped on the invoices by the railway storekeeper, and deducted from the same in the company's office when payment is made.

If the needs of the service so require, when a contractor has failed to deliver a part or the whole of the equipment contracted for, the railway may purchase the materials or articles directly for the account of the contractor responsible for the delay, deducting the difference in price it is obliged to pay from the amount of said contractor's guaranty certificate, up to its full value.

In cases of delay in delivery causing damage, the railway may, of its own accord, cancel the contract, the respective guaranty deposit remaining in the company's possession.

Rejection of bids.—The superintendent reserves the right to accept or reject any bid, in whole or in part, even though the respective price may not be the lowest offered, without the right, on the part of the other bidders, to prefer any claim.

Tax laws.—Each bidder must send in with his bid a certificate from the competent office, stating that he has complied with the tax laws.

Delivery of ties and fence posts.—These articles shall be delivered on the docks of the railway, placed in cars, and well packed.

Filing and opening the bids.—Bids shall be presented in a stamped and sealed envelope addressed to the superintendent of the railway, and the date of opening the respective bid must be noted on the margin of the envelope.

Separate bids must be submitted for each list. A bid including several lists in one shall not be accepted.

The bids shall be submitted and opened in Arica, in the office of the superintendent of the Chilean section of the Arica-La Paz Railway, or in that designated by him, at 3 p. m. of the days indicated in the respective lists.

In case the bidder resides outside of Arica, he may announce by telegraph, at least one day before the bids are opened, that he has sent in a bid, stating the number of the corresponding postal receipt. Unless this is done, the bid shall be disregarded.

Appendix I.—LIST OF RAILWAYS IN CHILE

The following is an alphabetical list of the railways in Chile, giving the official names and other names by which they are known. The page on which a discussion of the particular railway can be found is indicated.

Agua Blanca Railway, 138.

Andes Copper Mining Co. Railway, 201.

Anglo-Chilean Consolidated Nitrate Corporation Railway, 185.

Antofagasta and Mejillones to Oruro Railway (Antofagasta (Chile) & Bolivia Railway Co. (Ltd.)), 125.

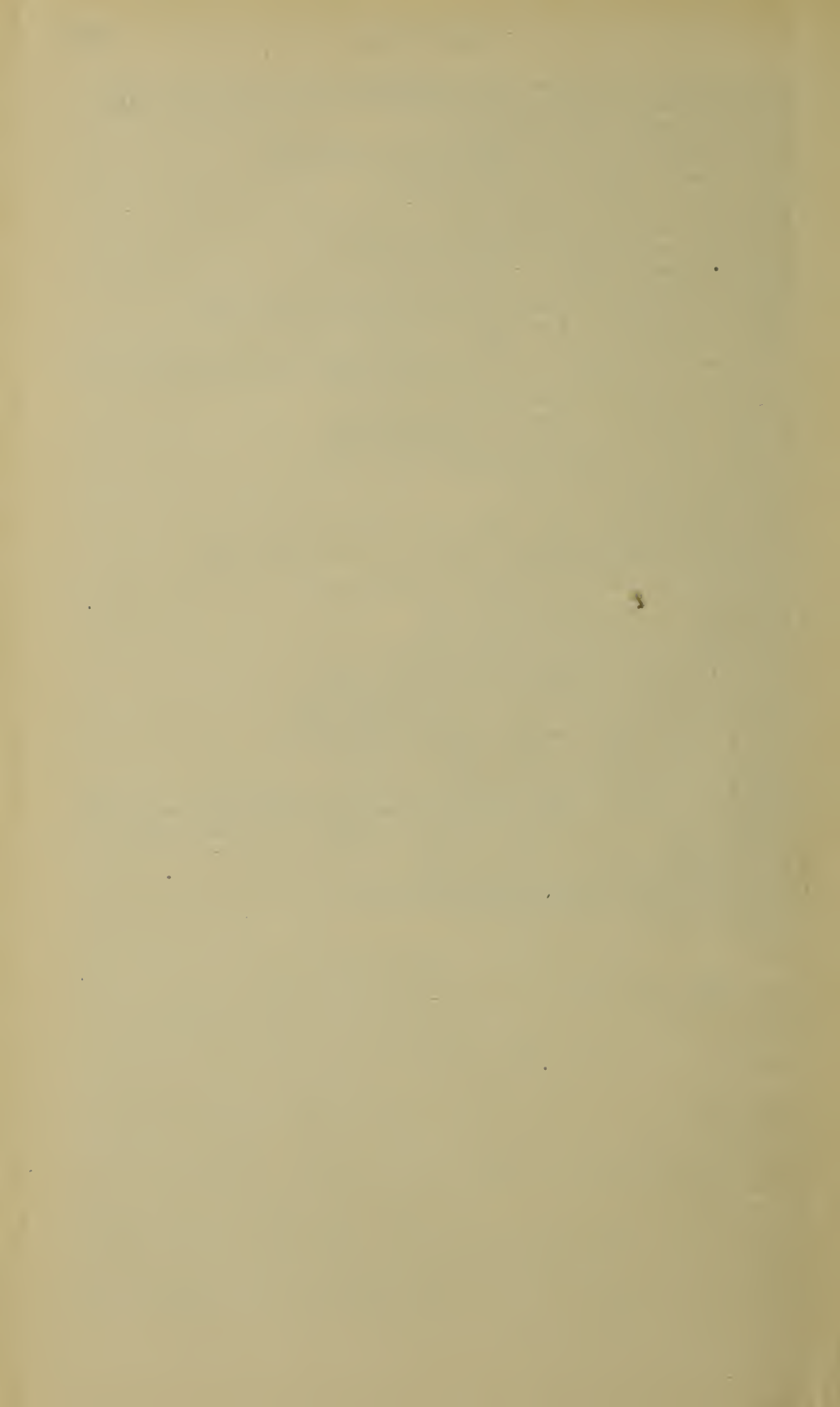
Antofagasta (Chile) & Bolivia Railway Co. (Ltd.), 114.

Antofagasta to Salta Railway (transandean), 160.

- Antuco Trans-andine Railway Co. (Ltd.), 164.
 Arauco Co. (Ltd.), 206.
 Arica-La Paz Railway, 91.
 Arica & Tacna Railway, 108.
 Bethlehem-Chile Iron Mine Co. Railway, 202.
 Bolivia Railway Co., 127.
 Braden Copper Co. Railway, The, 203.
 Caldera al Algarrobo, Ferrocarril, 213.
 Caldera to Timogasta Railway (proposed transandean), 144.
 Caleta Buena to Agua Santa Railway, 175.
 Caleta Coloso Railway, 138.
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 Carbonifera de Los Alamos, Compañía, 210.
 Carbonifera Trihueco, Compañía, 213.
 Carrizal & Cerro Blanco Railway Co., 213.
 Carrizal-Yerba Buena Railway, 213.
 Central railway system (State railways), 54.
 Cerro Gordo a Chellacollo, Ferrocarril, 225.
 Cerro San Cristobal Cable Railway, 222.
 Chanaral Railway (Chilean Northern Railway Co.), 142.
 Chile Exploration Co. Railway, 199.
 Chilean Nitrate Railway Co., 175.
 Chilena Alamana Holandesa Mineral de Algarrobo, Compañía (proposed), 238.
 Chilena de Electricidad, Compañía, 239.
 Chilean Northern Railway Co. (Antofagasta (Chile) & Bolivia Railway Co. (Ltd.)), 140.
 Chilean Transandine Railway, 146.
 Chillan street railway system, 248.
 Chuquicamata Railway, 199.
 Cocule to Lago Ranco Railway (proposed), 238.
 Concepcion Arauco Curanilahue, Ferrocarril, 206.
 Concepcion to Talcahuano street railway system, 256.
 Corte Alto-Rio Frio Railway (proposed), 238.
 Electrica de Concepcion, Compañía, 256.
 Electrico de Cruz Grande al Tofo, Ferrocarril, 202.
 Electrico de Villa Alegre, Sociedad Ferrocarril (animal traction), 261.
 Funicular San Cristobal of Santiago, 222.
 General Cruz-Cartago, Ferrocarril (transandean), 166.
 General Cruz to Pemuco Railway (transandean), 166.
 General de Electricidad Industrial, Compañía, 245.
 Hualane to Constitucion Railway (proposed), 238.
 Hundido a Potrerillos, Ferrocarril, 201.
 Iquique a Pisagua, Ferrocarril (Nitrate Railways (Ltd.)), 178.
 Iquique to Pintados Railway (Longitudinal Northern Railway), 178.
 Iquique Tramway Co., 260.
 Junin Railway, 260.
 Lanco to Guahun Pass Railway (proposed transandean), 168.
 Lanco to Portezuelo Railway (proposed transandean), 168.
 Llano de Maipo Railway (transandean), 161.
 Loncoche-Villarrica Railway (proposed), 237.
 Longitudinal Northern Railway (Iquique to Pintados railway), 107.
 Lonquimay Railway (proposed transandean), 167.
 Loreto Coal Mine Railway, 220.
 Los Alamos to Curanilahue Railway (proposed), 238.
 Los Alamos-Trehueco Railway, 210.
 Los Lagos a Rinihue, Ferrocarril (transandean), 167.
 Melipilla a Ibacache, Ferrocarril, 215.
 "Menendez Behety," Sociedad Anonima Ganadera y Comercial, 220.
 Minera e Industrial de Chile, Compañía, 206.
 Mineral de Chuquicamata, Ferrocarril, 199.
 Nitrate Railways (Ltd.), 178.
 Oruro to Cochabamba Railway (Bolivia Railway Co.), 128.
 Oruro to Viacha Railway (Bolivia Railway Co.), 127.
 Paniahue a Santa Cruz, Ferrocarril (animal traction), 262.
 Pirque, Ferrocarril a (transandean), 161.
 Port of San Antonio to Las Cabras Railway (proposed), 233.

- Pozo Almonte to Pica Railway (proposed), 234.
 Pueblo Hundido to Pintados Railway (Chilean Northern Railway Co.), 140.
 Puente Alto to El Volcan Railway, 105.
 Puerto & Balneario Quintero Railway, 217.
 Puerto Montt to Puerto Toledo Railway (proposed), 226.
 Punta Arenas to Mina Loreto Railway, 220.
 Quino-Galvarino Railway (proposed), 237.
 Rancagua al Teniente, Ferrocarril, 203.
 Rancagua street-railway system, 247.
 Red Central North Railway (central system), 54.
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 Rio Buena-Maullin Railway (proposed), 238.
 Saliteros de Tarapaca, Ferrocarril (Nitrate Railways (Ltd.)), 178.
 Salitres y Ferrocarril de Agua Santa, Compañía de, 175.
 Salitres y Ferrocarril de Junin, 172.
 San Antonio to San Carlos via El Volcan Railway (proposed transandean), 145.
 San Clemente to Mariposa Railway (proposed), 238.
 San Pedro to Quintero Railway, 217.
 Santiago & Talagante Railway (proposed), 233.
 Santiago to Barrancas Railway (transandean), 161.
 Santiago to San Bernardo Electric Railway Co., 244.
 Santiago Tramway & Light Co., 240.
 Talca street-railway system, 249.
 Taltal Railway, 190.
 Temuco street-railway system, 240.
 Tierra del Fuego, Ferrocarril de la Sociedad Explotadora de, 224.
 Tocopilla to Toco Railway, 185.
 Transandine Railway via Lonquimay (proposed), 167.
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 Transandino por Antuco, Ferrocarril, 164.
 Transandino por Juncal, Ferrocarril, 146.
 Transandino por San Martin, Ferrocarril, 163.
 Urbano de Chillan, Compañía (animal traction), 260.
 Urbano de Coquimbo, Ferrocarril (animal traction), 263.
 Urbano de Quillotta, Ferrocarril (animal traction), 263.
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 Uyuni to Atocha Railway (Bolivia Railway Co.), 127.
 Valparaiso street-railway system, 250.
 Valparaiso to Santiago via Casa Blanca Railway (proposed), 233.
 Valparaiso to Santiago via the Cuesta de Chacabuco Railway (proposed), 238.
 Viacha to La Paz Railway (Antofagasta (Chile) & Bolivia Railway Co. (Ltd.)), 126.
 Villa Industrial a Tacora, Ferrocarril, 217.
 Vina del Mar street-railway system, 250.
 Yungay Barranca y Pudahuel, Ferrocarril de, 224.
 Yungay a Pudahuel, Ferrocarril, 224.





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